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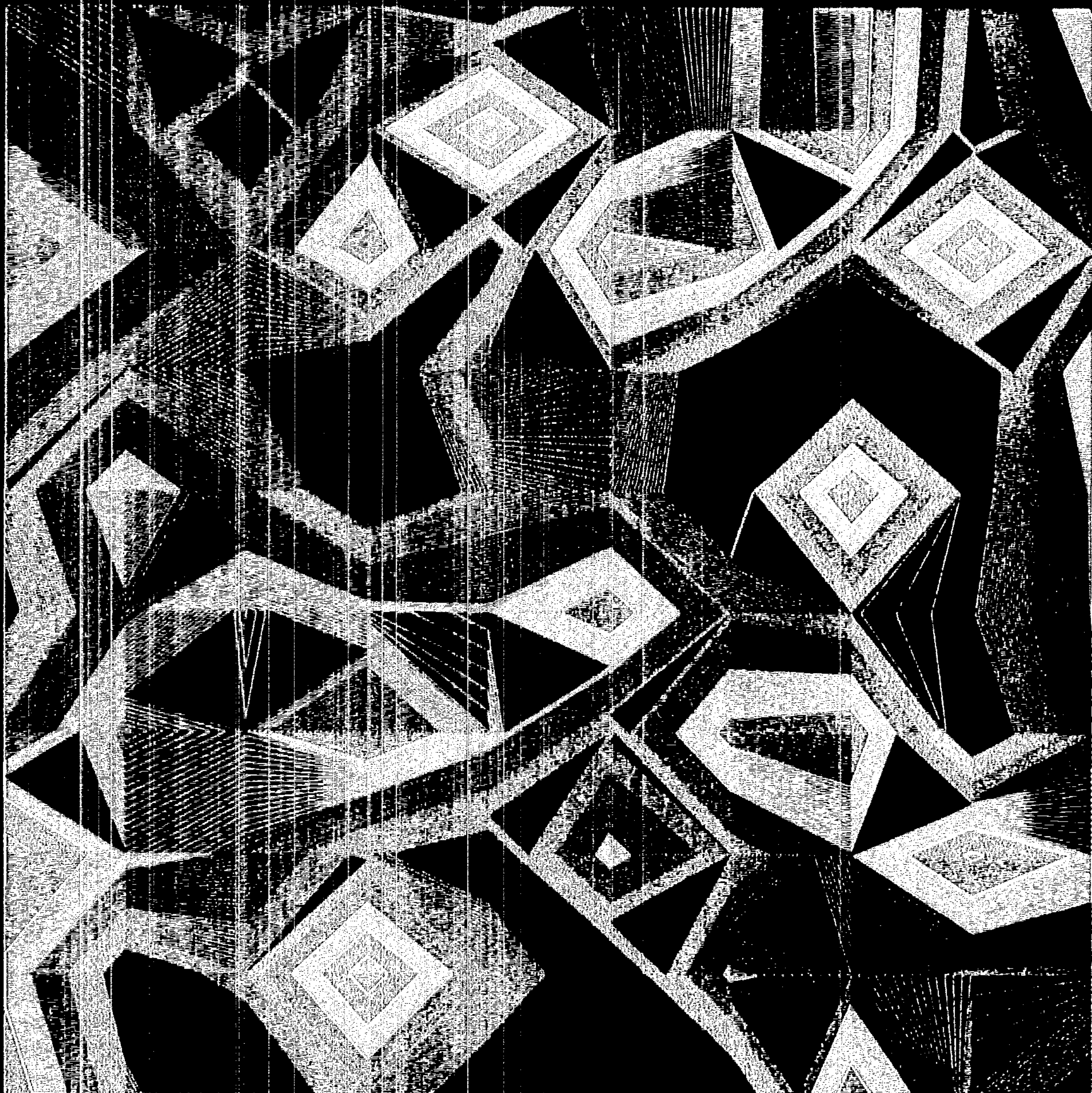
atom

Los Alamos Scientific Laboratory

computer graphics



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contents

On the cover: The computer-generated landscape, a contour map, was done by Mel Prueitt (X-4) using his PICTURA program.
Left: Prueitt's CONTUR program generated this course mesh map.

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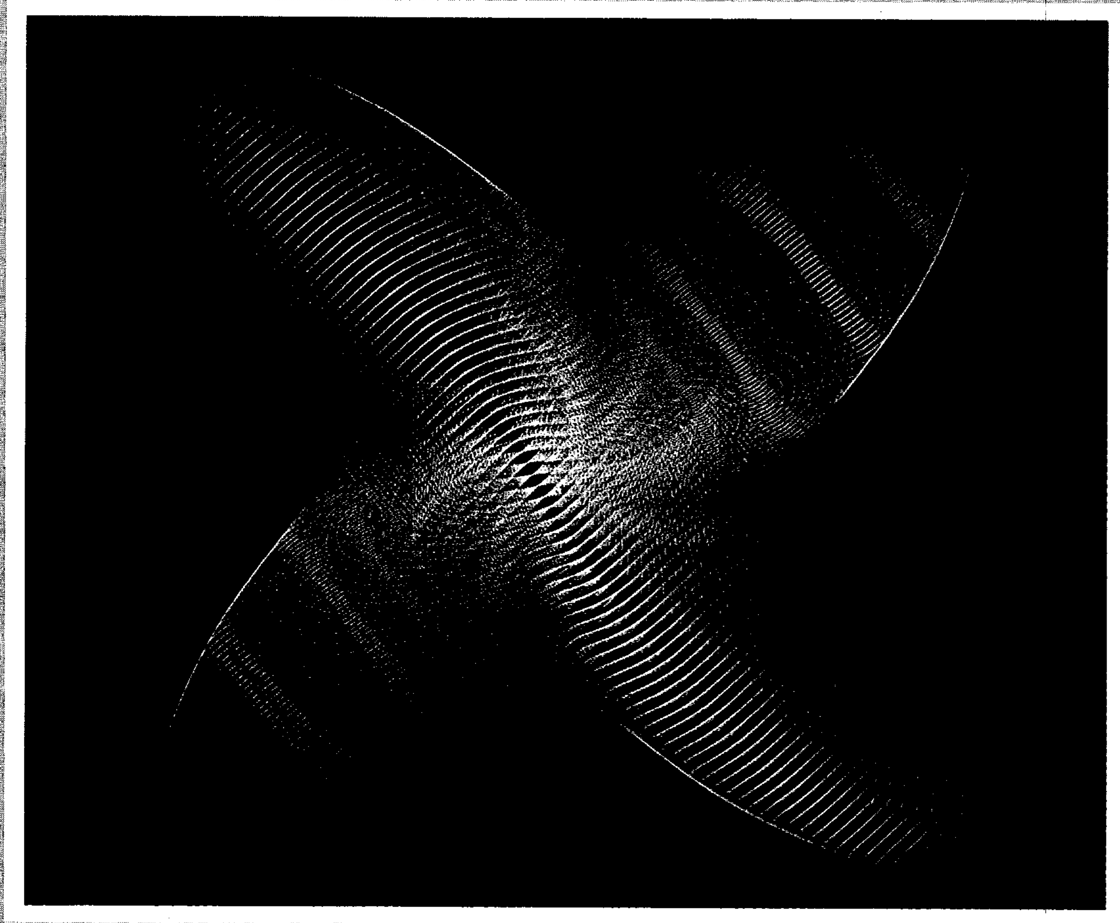


computer graphics: research tool & art form

By Jeannette J. Mortensen

In trying to solve technological problems, researchers can quickly be overwhelmed by the torrent of numbers spewed forth from high-speed computers. But there is a solution to the numerical flood: computer graphics. Not only can computers generate reams of data; they can also condense and reproduce those numbers into concise, easy-to-assimilate pictures. The adage "a picture is worth a thousand words" might, in this case, be restated as "a picture is worth a million numbers."

More than a graph of a computer

Computer graphics is a broad term for any pictorial product from computers — art, maps, graphs, flow diagrams, pie charts, bar charts, contours, schematics, tables, animation . . . The types of graphics and their applications are almost endless.

The diversity of applications at LASL ranges from title slides for presentations, to movie animation, to weapons design work. As a design and research tool, computer graphics can, for example, be used to study details of a nuclear detonation in intervals of fractions of microseconds. Using computer graphics, scientists can analyze computer simulations of accidents in nuclear power reactors. They can enhance and sharpen blurred photographs and X-rays. And they can construct three-dimensional models of complex equipment or architectural structures and rapidly explore the effects of design changes before the device or building is constructed.

There are two ways a computer can produce graphics — by drawing dots or by drawing lines. In raster graphics, as in a television picture and printed photographs, images are formed by combinations of dots of varying intensities. The line method, called vector graphics, characterizes most of the computer-generated illustrations produced at LASL, because most of our equipment and computer programs (hardware and software) are designed for vector plots. However, vector graphics are not limited to linear designs. By connecting series of short angled lines, vector graphics can yield curves, circles and ellipses — any shape imaginable.

Computer graphics may appear on the screen of a computer terminal (CRT) or on paper or film ("hard copy"). At LASL,

By repeating and rotating a simple symbol, a computer can produce a "flower."

computer users can choose from a variety of hard copy "output." Some users have printer accessories on their terminals, which allow them to print, within seconds, an 8½-inch-wide paper copy of whatever appears on the screen of their CRTS. Or they may have their illustrations produced on 11 or 36-inch-wide electrostatic paper by Versatec plotters in the Computer Division.

Many computer users select film output for their graphics because of its versatility, compactness and high resolution. They can select 35 millimeter (mm) slides in black and white or color, 16mm color motion pictures or 105mm black and white microfiche. The microfiche compacts the equivalent of 250 pages of computer printout onto a 4 by 6 inch card.

"The bulk of computer graphics — about 80 per cent — goes to microfiche," said Ray Elliott, leader of the Computer Graphics group, C-6. Last year LASL computer users produced 576,000 microfiche. "Assuming that the fiche were half full, that's about 60 million pages or plots."

In addition to the microfiche, cameras in the computing facility were also busy clicking away 2 million frames of 16mm color motion picture film and a million frames of 35mm film, about half black and white and half color. The millions of frames of film, however, are not all graphics; they also include unexposed leader and frames that identify the user, date and other record-keeping data.

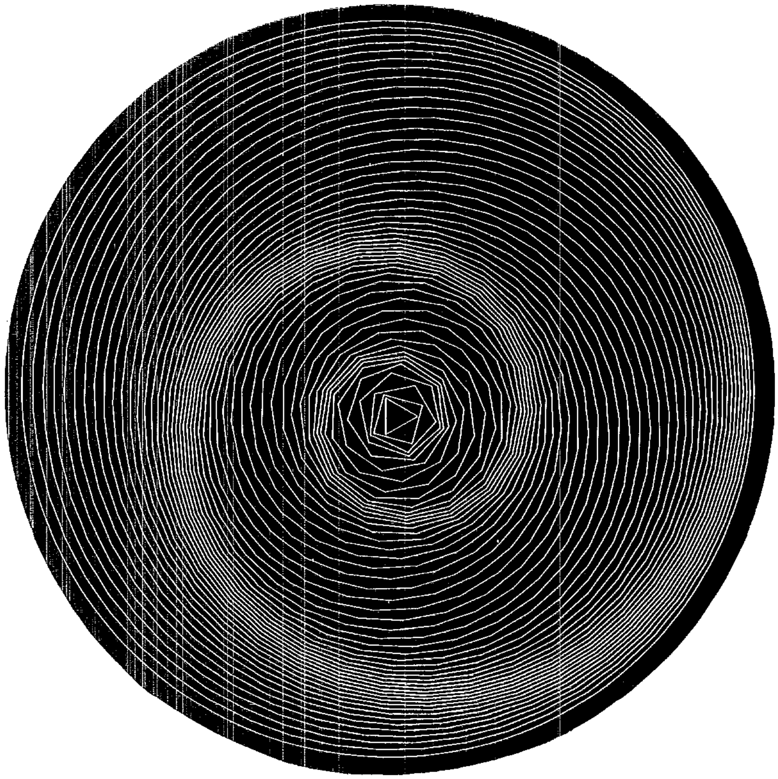
Color and dimension

A dozen years ago, LASL first offered the capability of adding color to its computer graphics produced on film. Initially, only three colors were available for two-dimensional illustrations. Soon it was obvious that this was inadequate. With new codes and hardware, the capability expanded to three-dimensional graphics in seven colors. Today LASL's computer users can mix hundreds of shades of colors, using the red, blue and green filters on special computer-controlled cameras.

Color offers several advantages. Basically, it makes complex illustrations easier to comprehend. With color, upper and lower sides of a surface can be easily distinguished. Parts of illustrations can be coded to be color dependent. For example, temperatures can range from a cool blue of zero degrees to a hot red of 1000 degrees, making it easy for a viewer to sort and interpret the information quickly.

Although we use the term "three-dimensional graphics," it is actually a

Ray Elliott



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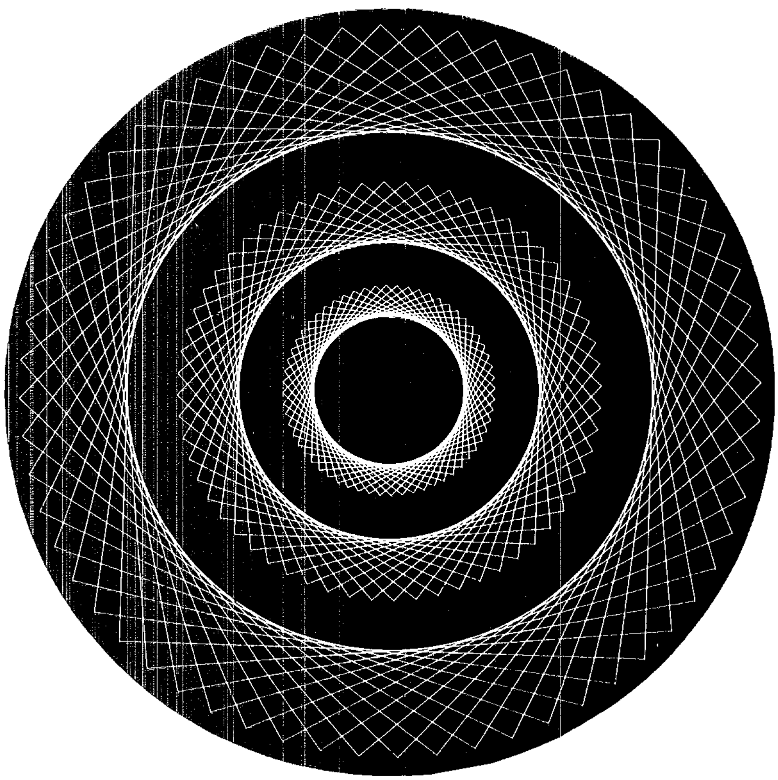

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Top: In vector graphics, a computer draws a circle by connecting many short angled lines. Bottom: Intricate and intriguing designs can be made simply by rotating a square. This illustration, by Ray Elliott and Barbara Jones (C-6), was done for the "Designs by Computer" exhibit.

misnomer. It is physically impossible to create a three-dimensional image on a flat sheet of paper or film. Through the use of perspective, what we see is the illusion of the third dimension. But in the mind's eye, illusions can appear very realistic.

Another feature of computer graphics is that the images can be zoomed in or out for macro or micro views. They can be rotated clockwise, counterclockwise or spun end over end to give researchers top, bottom and side views without their ever having to stretch their necks.

By adding a fourth dimension — time — to computer graphics, researchers can speed up geologic processes that take millions of years or slow down explosions that occur in microseconds. They can simulate flight and practice landing on the moon.

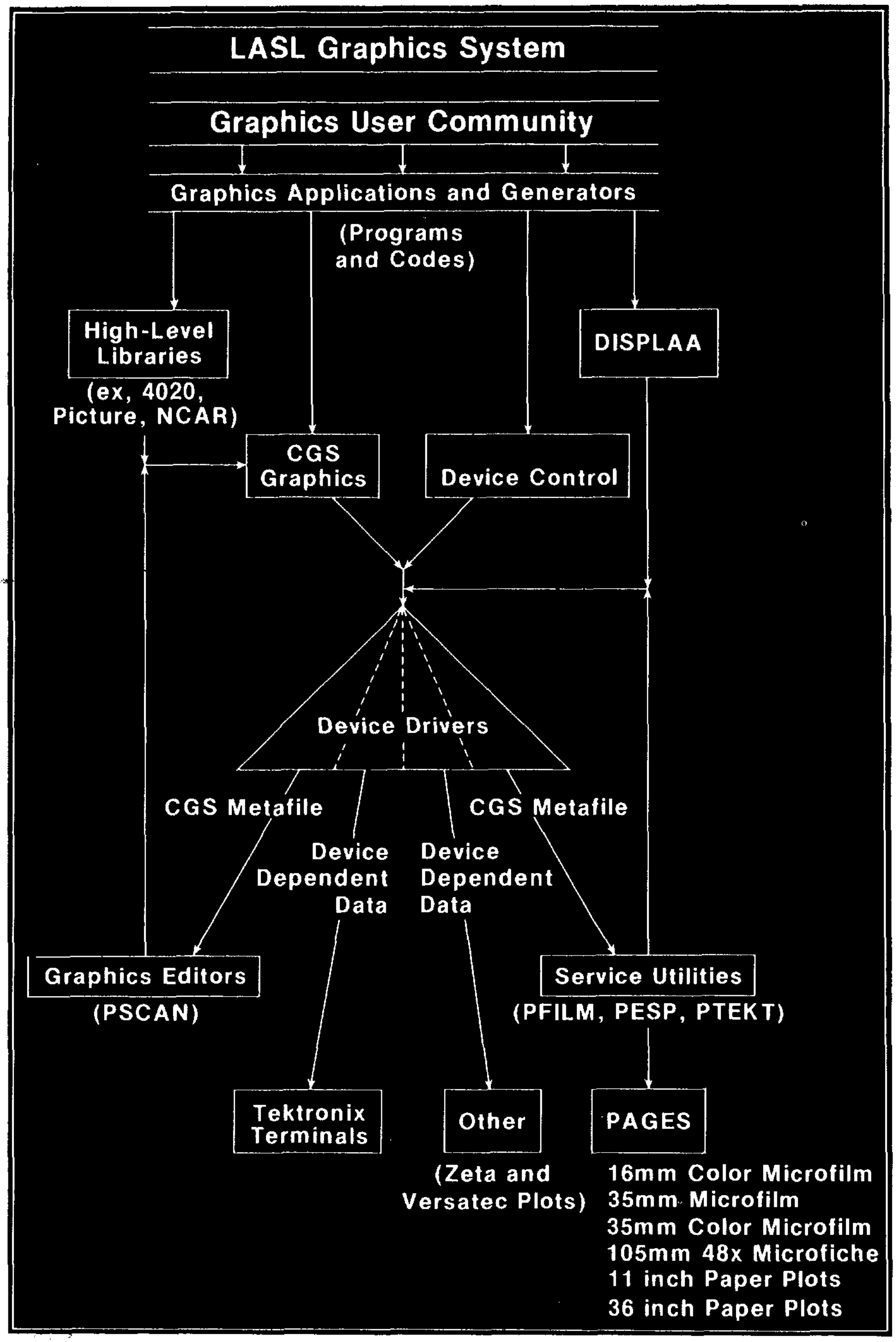
LASL has made many notable contributions during the brief history of computer graphics. We were first to directly generate 16mm color movies with the computer. It happened in 1969 after our computer staff added color filters to a Stromberg Carlson SC 4020 film recorder and exposed color film.

The first LASL color computer film was released to the public in 1973. The film, "Mirror-mode Run," on LASL's controlled thermonuclear fusion research, won the 1976 Rosse Award for "pioneering work in color computer graphics." LASL's Don Dickman, Chet Kazek, Frank Berry, Bob Crook and Dave Buckner worked on the film. Since then, computer-generated color movies have been invaluable to LASL weapon designers, solar architects and fusion researchers, to mention a few. Color computer graphics have also been used effectively in Laboratory-produced promotional and educational films, some of which have garnered international awards and acclaim for the Laboratory.

Users, software and hardware

There are about 3,050 CCF (Central Computing Facility) users. "One-fourth to one-half of them use computer graphics," Elliott said. Many of them do their work on LASL's 400 Tektronix graphics terminals.

Seated in front of their CRTs, programmers, engineers, illustrators and word processors type out instructions to one of their division's computers or to one of several powerful "worker machines" in the CCF: Cray 1s, a CDC 6600 and CDC 7600s - all of which can perform millions of calculations a second.



Right: Ray Elliott, C-6 group leader, oversees the computer graphics effort at LASL. Photo by LeRoy N. Sanchez. Computer digitization by Mike Cannon (M-5). (An article on M-5 work will appear in the next issue of the Atom.)

Linking the users in their offices and the high-speed number crunchers in the computing facility are miles of electrical cables, sophisticated information storage devices, several small computers and rooms full of processing equipment. But to make the expensive, sophisticated hardware do anything, users must have software — computer programs and codes — to communicate with the machines.

Coded for graphics

CCF users can select from several C-6 supported computer codes to generate their graphics or can develop their own to suit their needs. Elliott speculates that there may be as many as 100 graphics programs in use at the Lab. Among the codes maintained by C-6 are: SLIDES, a simple code for generating alphanumeric illustrations; DRAW, for high-quality plots; MAPPER, a diverse, easy-to-use graphics package (see article on p.); GAS (Graphical Analysis System), which draws graphics for hydrodynamics data codes, primarily for weapons research; and MOVIE•LASL, the Laboratory's version of MOVIE•BYU (from Brigham Young University), for graphic analysis of data generated by finite-element codes.

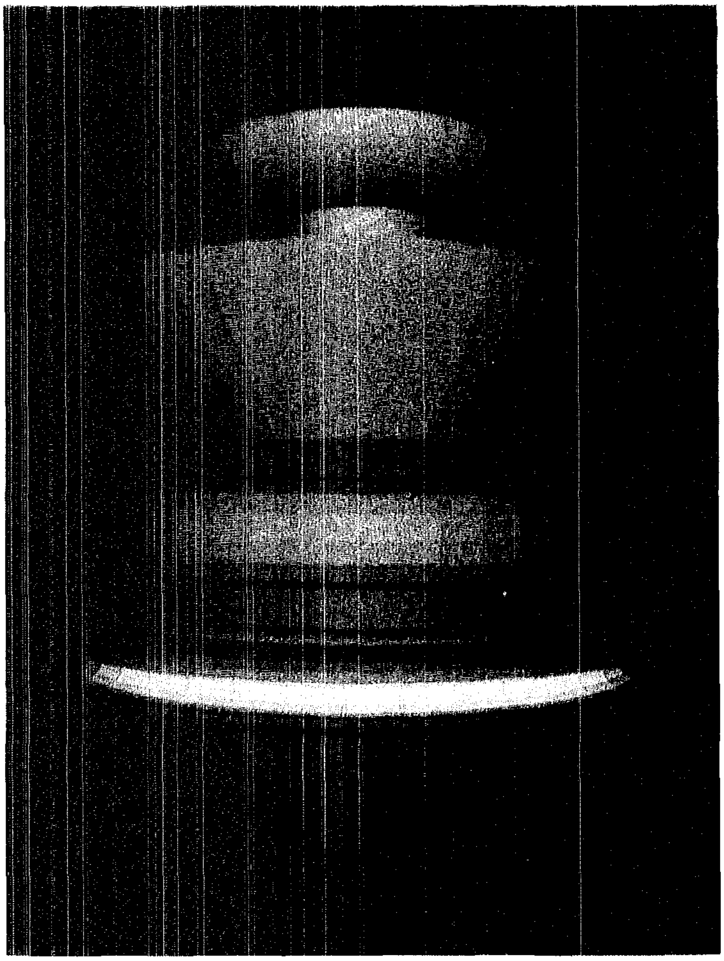
SLIDES, developed by Argonne National Laboratory, was brought here by Robert Ewald, C-Division leader. DRAW was produced by Jim George in C-6. Dave Dahl in H-8 created MAPPER. Eldon Pequette and Lynn Maas (formerly in C-6) wrote GAS. SLIDES, MAPPER and MOVIE are accessible on the CDC 6600 and 7600s; GAS is available on the 7600s and Crays; DRAW is available on the 6600.

The graphics codes are built upon the Common Graphics System (CGS), developed in C-6 by Ted Reed, Ann Solem and Rich Kellner. Elliott explains that the system "offers common user capabilities across all the CCF computers. It is the foundation for all the other graphics software and provides a standard interface for all of the graphics output. The CGS software is capable of drawing lines and characters and providing low-level graphics capabilities. It provides the basic graphics needed by most of the high-level graphics codes," Elliott said.

Once a user has written a computer file that can be read and executed by one of the graphics codes, he instructs the computer to run his "job." If he made an error in his file, many codes are designed to report back where and how he erred. If everything is OK, the results can appear within seconds on his terminal screen.

At this point, with some codes, the user can instruct the computer to make additions, deletions and alterations to the

Below: This simulated test surface by Jim Ferguson (X-6) is an example of a raster-like image produced with vector graphics.
Bottom: For "Trek to Totality," a LASL film on a solar eclipse, Mel Prueitt (X-4) produced an animated sequence of the moon tracking across the sun.



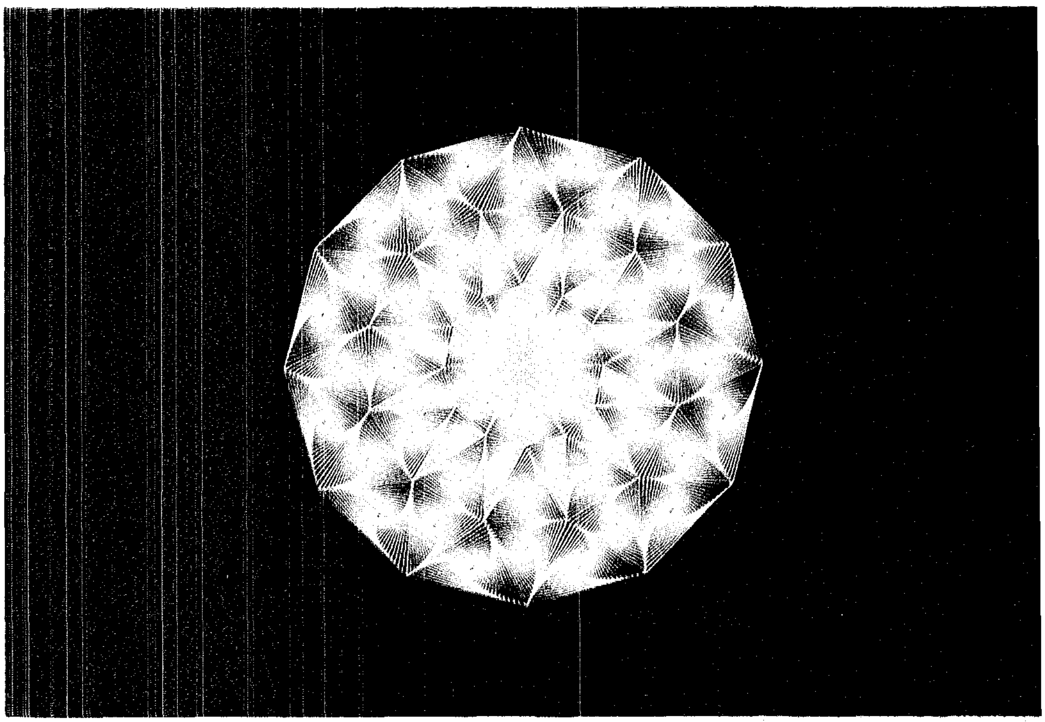


image. Named interactive editing, this process also allows a user to test several approaches or theories, to try new materials or different shapes without having to start from scratch each time.

Elliott emphasizes that our computer graphics capabilities are "device independent," which means users write computer files to generate graphics and *then* select whether they want the illustration to appear, for example, on their Tektronix screens or on 35mm color film.

Pages and film from PAGES

Once users ship their computer files to the CCF for hard copy output, they rely on C-Division machines and employees to produce the final product. This is when PAGES (Print and Graphics Express Station) takes over. PAGES is the Laboratory's new system for providing hard copy graphics. Also called the COM area (for Computer Output Microfilm), PAGES is located on the lower level of the CCF and is staffed by C-1 employees. The development of PAGES, which involved most of the groups in C Division, was led by Richard Wolf of C-6 and included group members Don Bradford, Griff Hamlin and Tim Locke.

For many users, PAGES is a big black box where who-knows-what magic occurs to turn files into pictures. Here's a glimpse of what takes place.

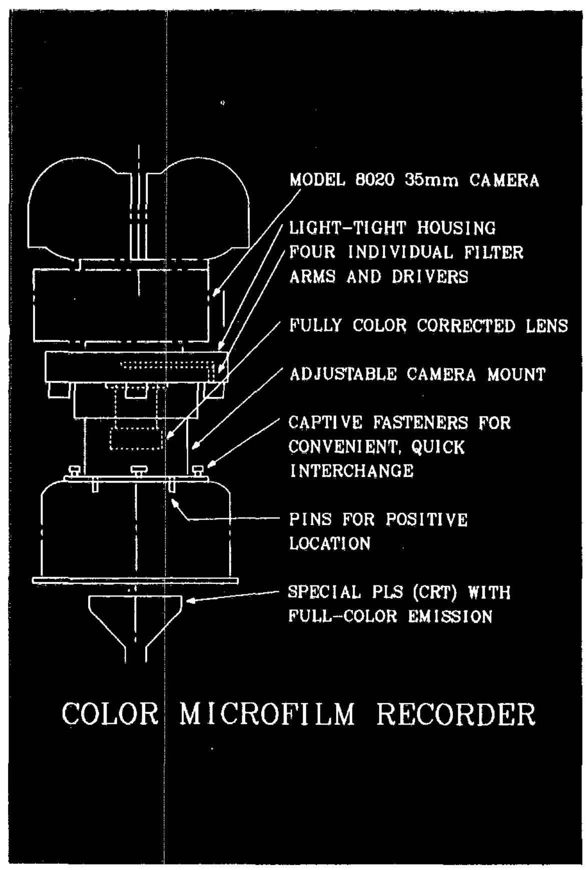
When a "worker machine" finishes processing a file that ends with a code designating "graphics hard copy wanted," it ships the job to the VAX 11/780 controller in PAGES. Currently the VAX rank jobs based on processing time. Short, quick jobs are run first. Elliott announced that C Division plans to reprogram jobs based on user-designated priority instead — background, normal or urgent.

Jobs are processed on two Versatec plotters, a Datagraphix 4560 (105mm microfiche), and three FR80s (16, 35 and 105mm film), depending on the output desired. Let's say the next job in the queue is requesting 35mm color film. The VAX sends the job "on line" to the long green console equipped with a small computer and a camera loaded with 400 feet of color film (for curious photo buffs, it's Kodak video news film, daylight 160 ASA). With lightning speed, the FR80 draws the graphic with an electron beam on its cathode ray tube (CRT). The graphic flashes on the console's viewing screen, unnoticed by PAGES employees to whom the mysteries of the trick are "old hat." The camera mounted over the CRT automatically captures the illustration on film and goes on to service the next customer.

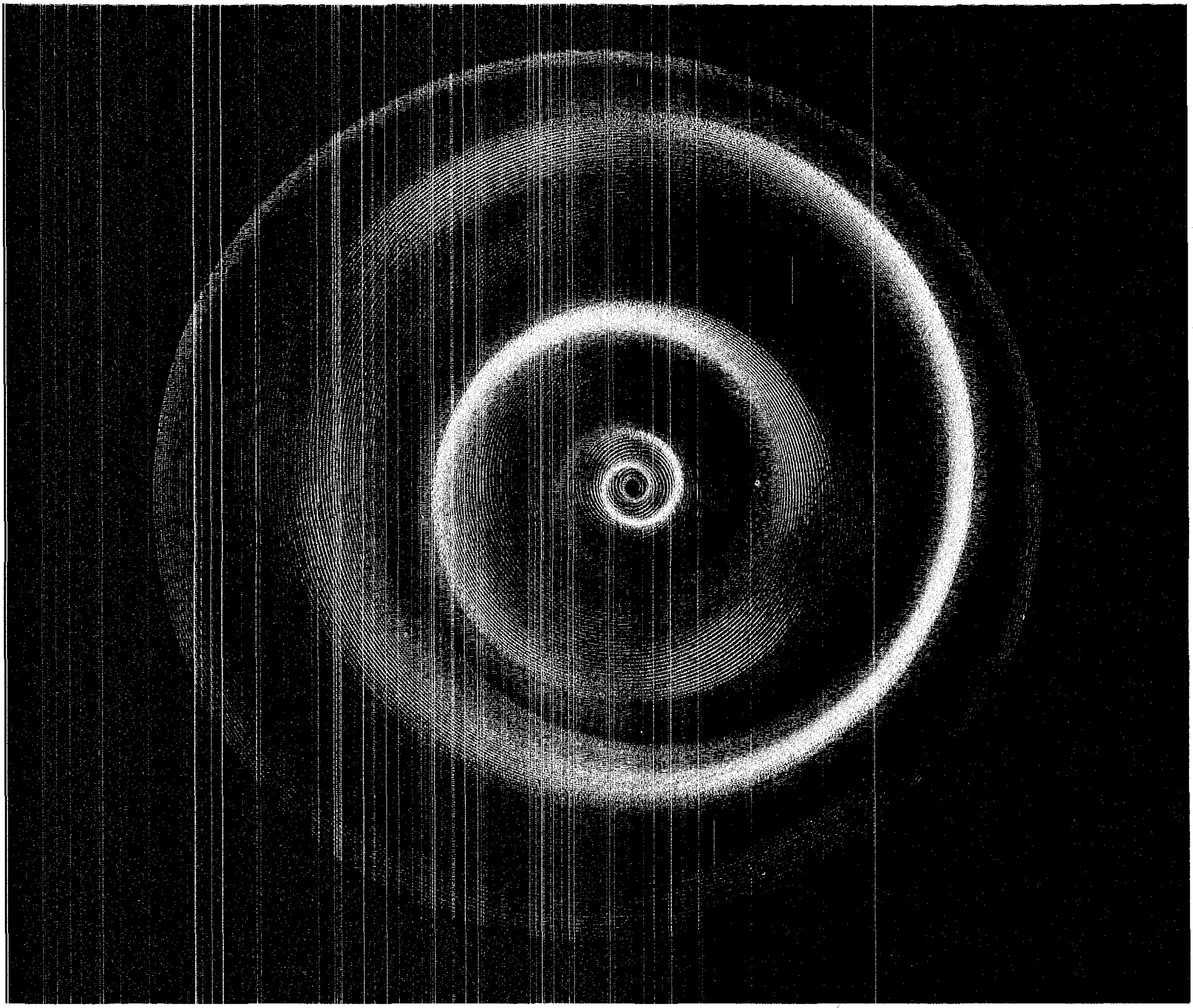
In a few hours, or when the magazine has run through its 400 feet of film, a PAGES operator removes the old magazine, inserts a new one and takes the exposed film to the lab for processing. The C-Division photo lab is just a few feet from the FR80s. Under quality-controlled conditions, the film is processed; then it's cut (one strip per job), wound on a plastic reel and secured with a rubber band. An identification tag is taped to each reel, then the reels are loaded onto a dumbwaiter and shipped upstairs for dispatching.

This scenario continues around the clock, two 12-hour shifts a day, seven days a week with three COM operators per shift handling the myriad chores that arise. The operators are truly "Jacks and Jills of all trades," processing film, troubleshooting defects and handling equipment.

Photographs by LeRoy N. Sanchez



Above left: Kenny Brown, C-1 lead operator for team A, reviews the queue of on-line computer graphics jobs.
Left: Hal Colburn runs a control strip test on the black and white film processor to check quality control.
Above: The components of the color microfilm recorder, part of the FR80.
Facing page: This spiral by Ray Elliott decorates the cover of a new C-Division brochure, "Computer Graphics."



Hal Colburn of C-1 is responsible for film quality control and troubleshooting problems on the FR80s. He processes quality control film strips twice a day and reads them on a densitometer to insure that film exposed today will match that from last week and any future time regardless of which FR80 produces it. Customers insist that any color used in the first 100 frames of a film remain the same in the next 100.

The PAGES system has already demonstrated its effectiveness. It has speeded up the FR80 color processing time by as much as a factor of 10, said Elliott. "It's equivalent to having 6 to 10 FR80s instead of just three." One of the reasons for the faster turnaround, Elliott explained, is that the jobs are now transferred directly to the equipment that produces the paper or film output. Previously the data were first transferred to magnetic tape, introducing an intermediate step that was prone to error.

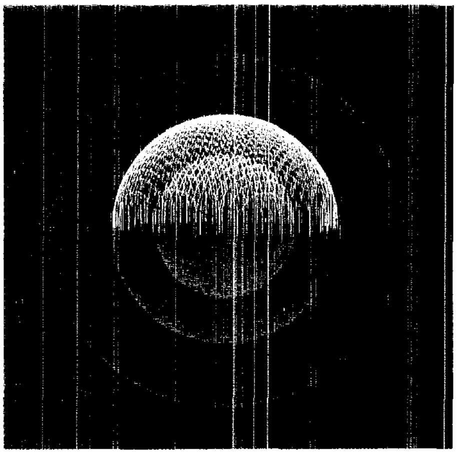
There are several plans to improve further the efficiency of PAGES. One will be enacted this fall when the PAGES equipment is moved upstairs, closer to where users pick up their output. High-speed laser printers, another improvement, are scheduled to arrive sometime next year. The new equipment will print 10,000 lines a minute (about two pages a second), about 15 times faster than our current printers. Also coming is automatic calibration for the graphics-generating equipment. In addition, PAGES users will find a new line on their output in October — a price tag. Elliott hopes the dollar figure will help the PAGES operation by making users aware of the time and resources to resources to produce their graphics.

Elliott is proud of the new PAGES operation and the conscientious C-1 Operations staff. "Even without equipment failures it often took two days to process color film. Now four hours is the average, and the longest is overnight."

Speaking of PAGES and C-6, Elliott said, "If we do our job right, everybody is happy. If we don't do our job right, they can't do theirs. We're working toward perfection. Cheaper and better is our goal."

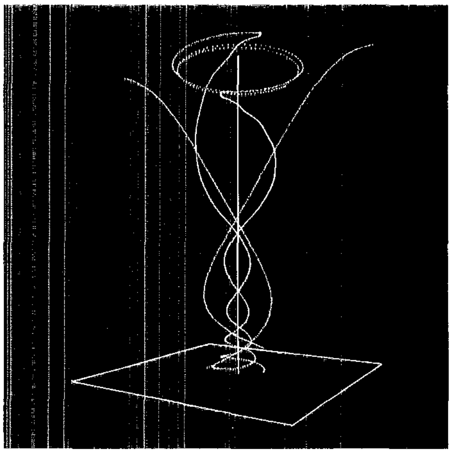
Editor's note: Copies of "Computer Graphics," a new brochure produced by C Division, are available from Group C-2, MS 253.

pictures at an exhibition



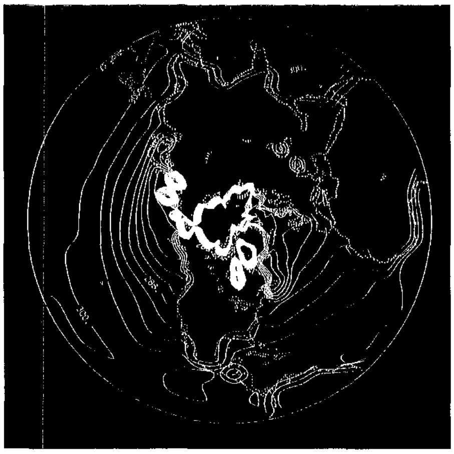
Melvin Prueitt

Concentric spheres with hidden lines removed.



Lee Stein

This computer simulation of the vortex of a tornado was used in a study of a tornado that hit Lubbock, Texas.



Bob Malone

This contour map, which shows temperatures of the northern hemisphere, was produced by a numerical model of the Earth's climate.

For sketch pads, the artists use green phosphorescent TV-like screens. Their brushes are electronic beams. The "artists" — scientists, engineers and programmers at LASL — could be called masters. Not as Rembrandt and Da Vinci are referred to as masters, but in the sense that these modern-day artists are masters over machines that produce their works of art.

Their paints are combinations made from three camera filters (red, green and blue), and their canvases are narrow frames of film. Yet, by playing the keyboards of their terminals, the artists compose visual symphonies.

Like electronic music, computer art is a new genre that has emerged from the space age; and like machine music, machine art is not always accepted, particularly by traditionalists. But in the Atomic City, the Fuller Lodge Art Center's first computer graphics exhibit got a very good review.

"I was surprised how well it was received," said Pat Loree, LASL fine arts consultant. "Quite a few local artists were very intrigued with what could be done with the computer. I thought we'd get questions about the exhibit regarding whether or not it is really art."

"Designs by Computers," financed by LASL's Computer Division and Public Affairs Department, was shown in the art center's gallery April 19 through May 15. Since then, the exhibit has hung in LASL's University House. Its next public showing is scheduled for October 9 through 19 at the First Northern Savings and Loan in Santa Fe during the Santa Fe Festival of the Arts.

The exhibit moves quickly from simple black and white line drawings of circles and squares to intricate, colorful forms. Some of the abstractions burst forth like a fireworks display against a moonless sky; others look like spotlit flowers or images seen through a kaleidoscope.

Though all visitors to the exhibit may not become converts to computer art, traditional and modern art aficionados can both find intriguing images that appeal to their sense of beauty.

Ann Barker, director of the art center, first discussed the idea for a computer graphics exhibit last year with Ray Elliott, Computer Graphics group leader. When the decision was made to go ahead with the exhibit, Elliott put out a call for computer graphics. His request, which reached Lab employees through the *C Division News,* yielded 300 unique slides.

"It was difficult to choose, but we had to limit the number for the exhibit," said Loree. A panel, composed of Elliott, Loree, Velma Payne (C-6), Steff Coonley (Museum Programs) and Susan Lewis (ISD-7), selected 41 favorites for printing and framing.

In addition to the 41 works selected, nine pieces of explanatory text (also computer-generated) accompany the exhibit to explain the how and why of computer art. One of those explains that "there is much art in science." Frequently, the graphic results of computer calculations are scientifically invaluable as well as being pleasing to the eye. Occasionally, striking designs are produced while the scientists are learning the capabilities of their research tools.

Most of the computer-generated photographs in the exhibit are examples of graphic representations of technical data that are also artistic. A few are examples of computer graphics for art's sake, produced while the scientist-artist was learning how to use the tools of the trade.

Also included in the exhibit at the Fuller Lodge Art Center were several LASL-produced films that incorporate computer graphics in motion. Many of the animated computer graphics scenes are even more awe-inspiring than their still-life counterparts. In "Infinity's Child," viewers enter the fourth dimension of computer graphics where one can "fly" over calculus landscapes and watch mathematical manta rays undulate across the screen.

Stored in a binder, duplicates of the 300 or so slides collected for the exhibit now serve as a showcase for the Computer Graphics group. They are available for C Division employees to use in presentations and reports. "People in the division are always borrowing them," Elliott said.

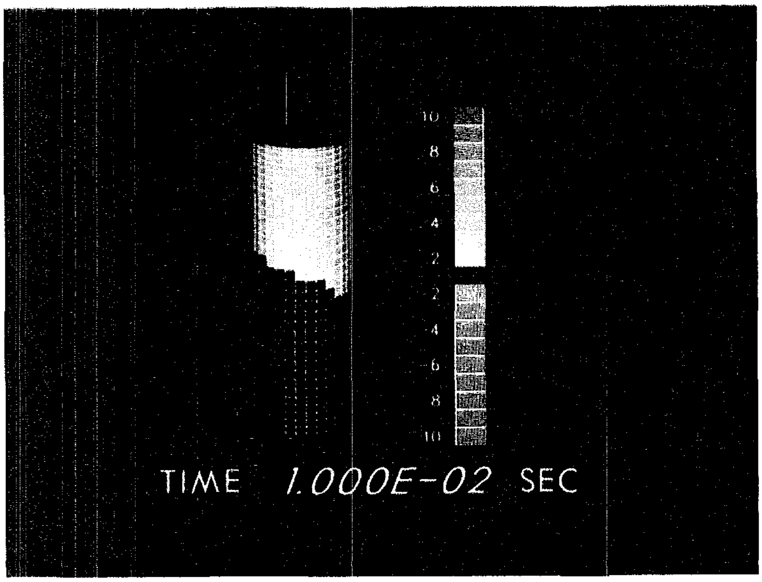
The computer graphic artists whose works appear in the exhibit include: Tom Butler, Lucy Carruthers, Dave Dahl, Don Dickman, Raymond Elliott, Jim Ferguson, Katie Greiner, Patrick Hodson, Myrle Johnson, Barbara Jones, Bob Malone, Mary Eve Martinez, Gerald Minerbo, Dick Morse, Velma Payne, Melvin Prueitt, Virginia Romero, John Ruminer, John Sibert, John Smith, Lee Stein, Mona Wechsung and David Whiteman.

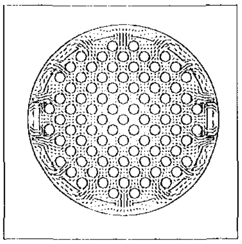
fluid dynamics codes simulate reactor flows

Some of LASL's hyrodynamics and graphics codes are being used to model potential loss-of-coolant accidents in nuclear reactors. The following two examples are from studies being conducted in the Hydrodynamics Group (T-3) for the Nuclear Regulatory Commission.

United States and German scientists participating in a joint program performed pre-test calculations for a full-scale loss-of-coolant experiment in which they measured the load on the core support and its resulting movement. Bill Rivard and Martin Torrey coupled their three-dimensional two-phase (steam-water) flow code K-FIX with John Dienes's structural response code FLX to simulate the interacting fluid and structural dynamics. The results of their calculations almost reproduce the subsequent test data. Ron Griego is processing their results with MAPPER to produce a motion picture showing the computer simulation.

Tony Amsden uses SALE-3D, a three-dimensional fluid dynamics code, to analyze coolant water flow and to compute the forces on 89 guide tubes (which encase the reactor control rods) in the upper plenum of a pressurized water reactor. He is investigating the consequences of a postulated break in one of the two water outlet pipes leading from the upper plenum. The motion of the water under the resulting depressurization could conceivably deform one or more of the guide tubes, thereby affecting the performance of the reactor. To study these effects, theoreticians must again couple the fluid motion (in this case Amsden's SALE-3D) with Dienes's structural response model. Depressurization calculations from normal steady-state flow require over a half million words of computer storage and run about 40 minutes on LASL's fastest computer, the Cray 1.





Top: This frame from Griego's film shows the calculated differences in pressure on the core support cylinder.
Bottom: This computer plot shows the flow of heated water through a horizontal plane in the reactor's upper plenum, as calculated by SALE-3D. At this level, 14 holes in the plenum cylinder allow water to flow into the region between the plenum cylinder and the outer core support. By Hans Ruppel and Tony Amsden.

illustrations made to order, by computer

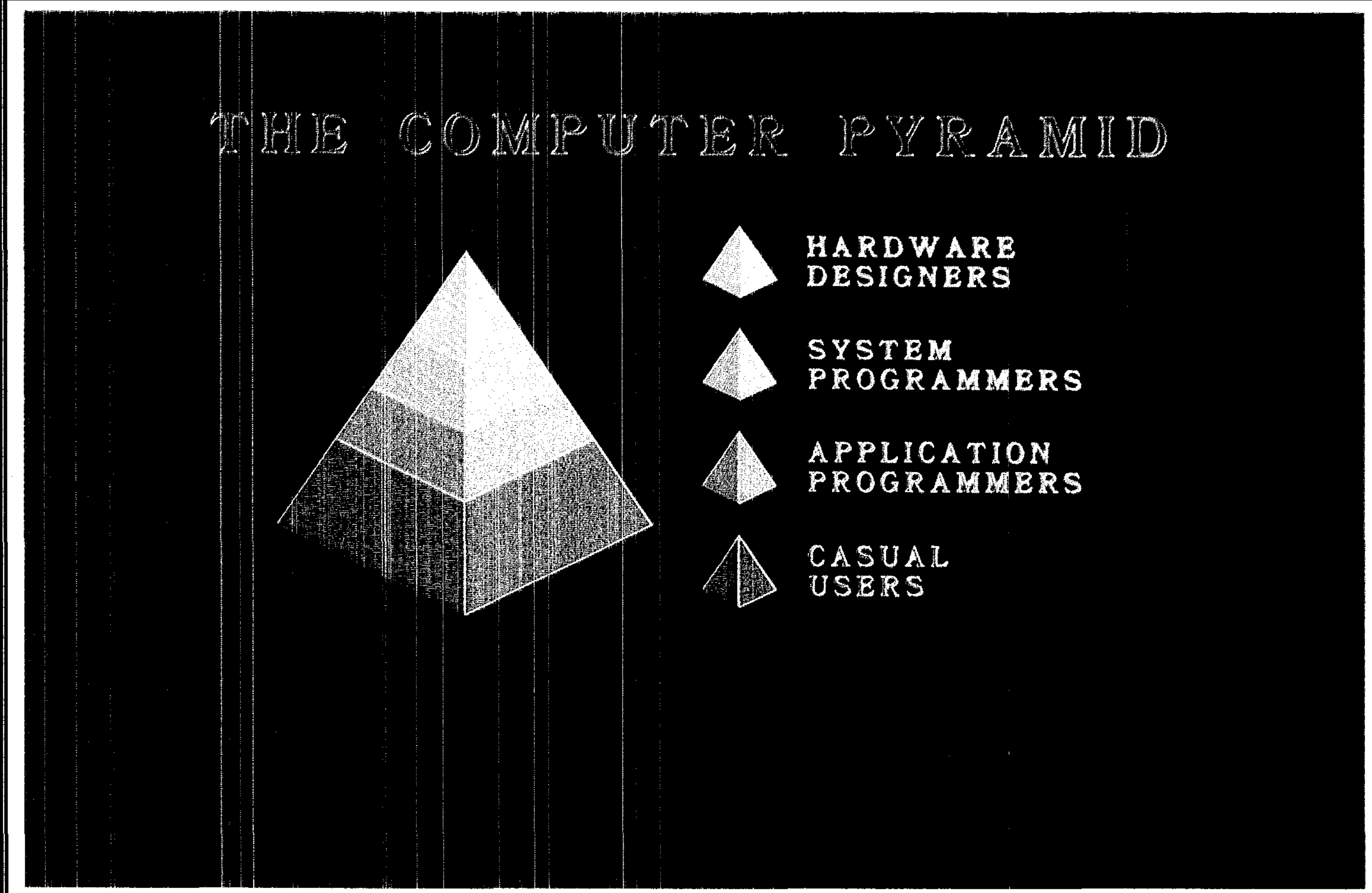
If you'd like some slides to illustrate your next report or talk but (A) you don't have access to a computer terminal, (B) you're too busy to produce the slides, or (C) you suffer from a severe case of computer anxiety, don't despair. A section in C-2 called Slides Services can solve your dilemma. Under the supervision of Georgene Berry, C-2 employees Virginia Romero, Mary Eve Martinez, Ruth Silbert, and Betty Hewett produce computer graphics for Lab employees.

For a reasonable hourly rate, you can get professional-looking computer-generated slides or VuGraphs. Simple text illustrations take only minutes; complex charts and diagrams, of course, take more time. Turnaround generally varies from two days to a week, depending on the complexity of the illustrations.

If the clientele (which includes Computer Graphics group leader Ray Elliott and C-Division leader Robert Ewald) that frequents the Slides Services office means anything, it shows C-2 is providing a valuable service to both programmers and non-programmers.

LeRoy N. Sanchez

Virginia Romero (left) and Mary Eve Martinez (right) "digitize" a map of the U.S. for one of their computer-generated illustrations while Betty Hewett (center) watches the map appear on the terminal.



mapper

An ad for MAPPER might read: "You too can make illustrations like these." But Dave Dahl, "father" of the popular computer graphics package, doesn't need to advertise MAPPER. The pleased people who use his program and the computer graphics they produce provide more than enough advertising.

MAPPER is an easy-to-learn and easy-to-use code designed to produce quality visual aids for reports and presentations. In computer lingo, MAPPER is a macro (a translator) for DISSPLA, a commercial package of subroutines useful in producing computer graphics.

A meteorologist by training, Dahl, who works in H-8, blends the practicality of an engineer, the technical know-how of a computer programmer and the patience and dedication of a teacher. That blend of qualities and his philosophy that computer programs should be utilitarian tools that serve the user have led to MAPPER's nationwide popularity. The history behind its success is now short but undoubtedly will continue to grow.

Necessity — the mother of invention

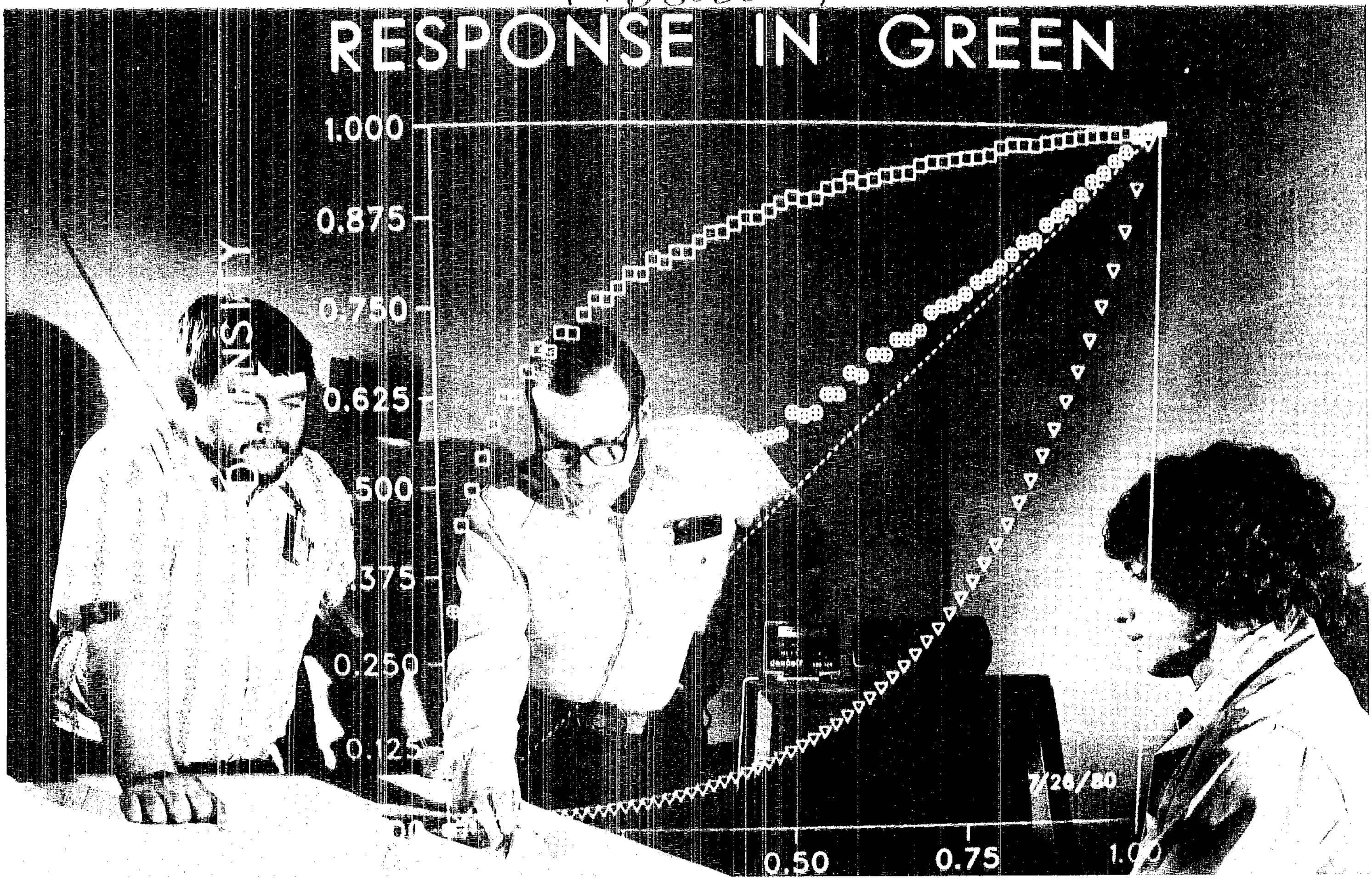
When asked how he got the idea for MAPPER, Dahl starts at the beginning. In the spring of 1977, Ed Essington, then with H-8, was fast approaching a deadline. He needed some maps for the Nevada Applied Ecology Group (NAEG) to show the inventory and distribution of radioactivity at the Nevada Test Site. He was looking for a way to plot the NAEG data and generate the maps on the computer.

"You've got to write me something, something I can talk to," Dahl remembers Essington pleading. So Dahl wrote something — a short, basic program about 200 lines long. He did it in a day. Because it was designed primarily to produce maps, he called it MAPPER.

With MAPPER, Essington made his maps in time. "We figured there were others in the group who could benefit from MAPPER, too," said Dahl. "Most didn't want to learn how to use FORTRAN. Besides, if you have to write a program for every graph it becomes a very tedious task, even if you are a good programmer."

As Dahl presupposed, there were others who were interested in a quick, easy way to produce illustrations. A community of employees (at first, mainly in H-8 and H-5) who were interested in learning and using MAPPER soon formed. The "user community" grew by leaps and bounds. And as more and more people started using MAPPER, Dahl got increasingly more comments on the code — comments like "I could really use that if . . ." And "If you would just make one

Above: Ron Griego's pyramid shows the bulk of LASL computer users as casual users who could benefit from easy-to-learn and use codes like MAPPER.



or two modifications I could use if for . . ."

Dahl's philosophy has been that MAPPER should serve its users. So the code grew in size and scope by evolutionary steps, "sometimes helter-skelter but based on user needs," he said. "The code evolved quietly for about six months in house (mainly H Division), with people just using the tar out of it." At the time there were only 30 to 40 MAPPER users. But constant streams of people were flowing through Dahl's and coworker Ken Rea's offices to learn how to use the code.

Good news travels fast

Soon the word about MAPPER spread Lab-wide. Partly in self defense, Dahl released MAPPER to the rest of the Laboratory in January 1978. He wrote a manual for C Division's program library; previously the manual was just a "help package" that users called up on their computer terminals.

But requests to learn how to use MAPPER continued to swamp Dahl and Rea. "There was such a clamor for a course that PAD-5 was approached to help establish one," said Rea.

"We were still teaching one and two people all the time," he recalled. "We got tired of it," Dahl added. They offered a formal MAPPER course in the fall of 1978; about 200 students registered. This time the two were teaching the teachers. They aimed to train employees who, in turn, would assume the teaching load and instruct other users in their divisions.

This course was taught by a team of MAPPER-dedicated teachers — Dahl, Rea, Ron Griego (T-3), Ed Kern (Q-4) and Bob Sherman (P-10). A second course followed in the spring of 1979 with Margaret Scott joining the teaching staff. Although classes are no longer offered, the course is available on videotape through E Division's training office. By calling the training office (7-5431 or 7-7064), anyone can schedule one-hour sessions to view the seven tapes that comprise the course. Or CCF-authorized users can teach themselves by obtaining a copy of the MAPPER manual from C Division's program library.

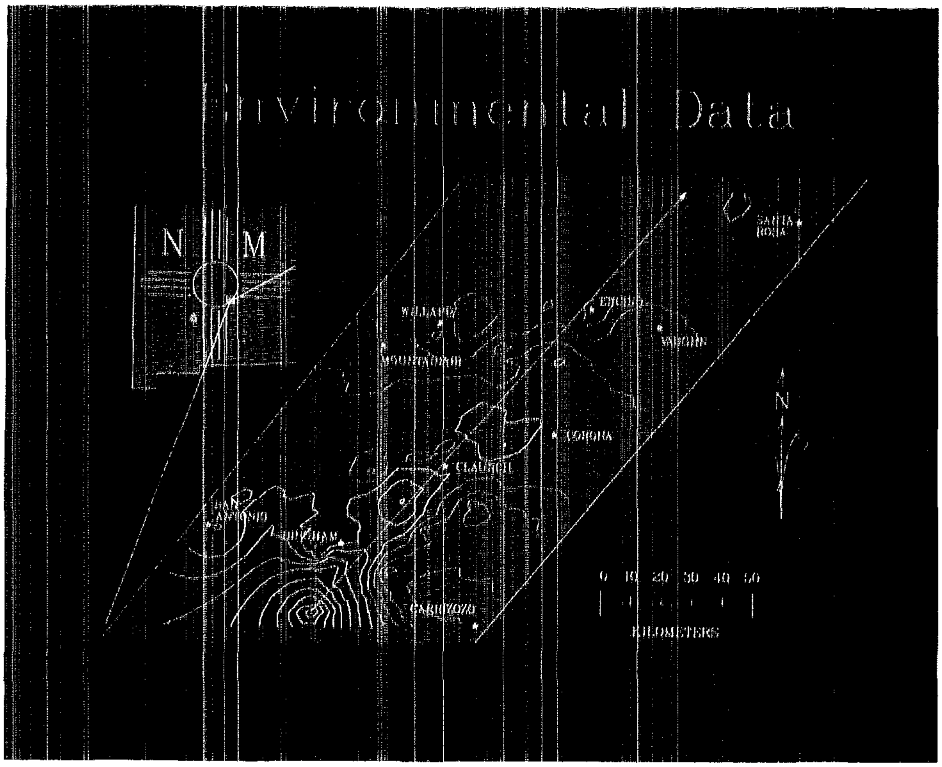
In the fall of 1978, Dahl had to transfer MAPPER from one compiler to another. A compiler is a sophisticated program that translates a program, written in a high-level computer language like FORTRAN, into computer instructions. At that point, Dahl decided to make some major changes in the code. The original manual was rewritten and Version 2 was released the following March.

The manual had grown from its fall 1977 pre-release version of 43 pages to more than 120 pages. Dahl explains in the manual that "this might seem larger than one would hope, but a beginning user need read only a small part of it to get high-quality text slides." Likewise, the length of the MAPPER program has grown from 1,500 to 3,000 lines. But with this growth, MAPPER's capabilities have also expanded.

The code originally was versatile but somewhat limited. It had a half dozen labeling commands and two lettering styles. Labels (alphanumeric material) could be sized or positioned manually or automatically (default mode). Lines, roads and shading could be done with dots, dashes, chain dots, chain dashes. Labels and symbols could be rotated. Backgrounds, labels and symbols could be shaded with a rainbow of colors. Dahl later added the capability for 12 lettering styles and several alphabets as well as many other options.

An appendix to the first manual lists 36 commands. Now there are 81. The commands allow the user to easily produce grids, circles, boxes, ellipses, lines, vectors, roads, shadings, contours and the LASL logo, to mention only a

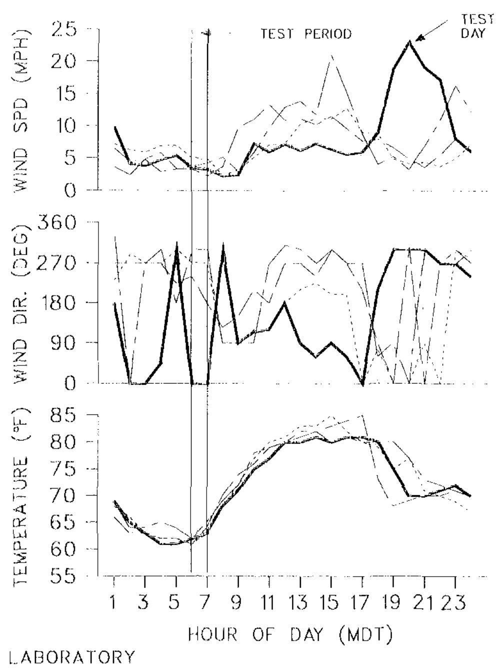
Above: Dave Dahl, Ken Rea (both H-8) and Ron Griego (T-3) look over Griego's latest work — how to compensate for the FR80's color mixing to achieve uniform, graded shading. Photo by LeRoy N. Sanchez.



Ken Rea

". . . the major focus of the code is to try to make all the neat stuff as easily available to the user as possible."

From H H H-8



Top: Maps by MAPPER have come a long way since the first simple black and white ones were produced in 1977.
Bottom: Weather data collected by meteorological instruments at the Occupational Health Laboratory are automatically transformed into graphs by MAPPER.

few. Other commands center labels, right or left justify them, or align a column of words or numbers by decimal points or any other designated symbol.

MAPPER now consists of four packages. The first is MAPPER itself. The second package, MAPEDIT, written in the fall of 1977, allows users to do interactive editing on a Tektronix computer terminal using the cursor lines. TABLET, the third package, appeared in spring 1978 and allows use of the Tektronix graphics tablet to write MAPPER files. It's based on PLOT 10, a software package sold by Tektronix. The fourth package, ANIMATE, made its debut in summer 1979. About that time the Computer Graphics group (C-6) assumed responsibility for MAPPER and converted it to run on LTSS (Livermore Time - Sharing System).

A year earlier, Tony Hirt of T-3 requested an extension of MAPPER that would allow him to make some simple movie leaders for films generated by hydrodynamics computer codes. "Leaders can be a pain, and it looked like MAPPER could do it easily," said Dahl.

"I had never done any work with movies," Dahl confessed, "so I asked Griego how to go about it." Ron Griego, then with H-8, had some experience with computer-generated movies working in L-5 with DISSPLA. "Dave immediately put on his thinking cap," said Griego, "and in about an hour we came up with a movie-making capability for MAPPER." By adding some simple commands to the program to repeat frames and to produce cinemagraphic techniques such as fades, dissolves and wipes, MAPPER made the leap from slides to motion pictures. T-3 members were so impressed with the results that they hired Griego to make films for them.

That summer Dahl and Rea wrote the ANIMATE package for MAPPER. The code was written in about three days. Later that summer, the programmers used the package to produce their first film. The four-minute movie, called ANIMATE, took about two weeks to produce and about $1,000 worth of computer time — much less than the cost of producing such a film with traditional animation techniques.

Dahl showed the film at the next computer graphics conference he attended. ANIMATE "brought the house down," Dahl recounted enthusiastically. Then in his usual, quiet, low-key way added, "It had a very nice review."

Computer graphics specialists from around the country were at the conference. They obviously were impressed by MAPPER because Dahl began to be flooded with requests for the code.

In his file folder of requests, the stationery bears the letterheads of Sandia Laboratories Albuquerque, EG&G Idaho, Oak Ridge National Laboratory and the Central Intelligence Agency. In all those organizations, MAPPER is up and running and producing illustrations for their computer users. MAPPER has also been sent to more than a dozen other organizations — industries (for example, Union Carbide Corp., Raytheon, Boeing), government installations (Kirtland AFB, the Bureau of the Census) and other national laboratories.

Other than, perhaps, a good feeling in his heart, Dahl (and the Laboratory) receive no compensation for the proliferation of the code. Computer codes cannot be patented, and copyrights have very little value. Programmers reap no special monetary rewards for their efforts nor gain much recognition (other than an occasional *Atom* story).

But Dahl's work on MAPPER has always been a labor of love. "Dave's done a lot of work on MAPPER in the evenings and on weekends," said Rea. "It's been more like a hobby than a job assignment."

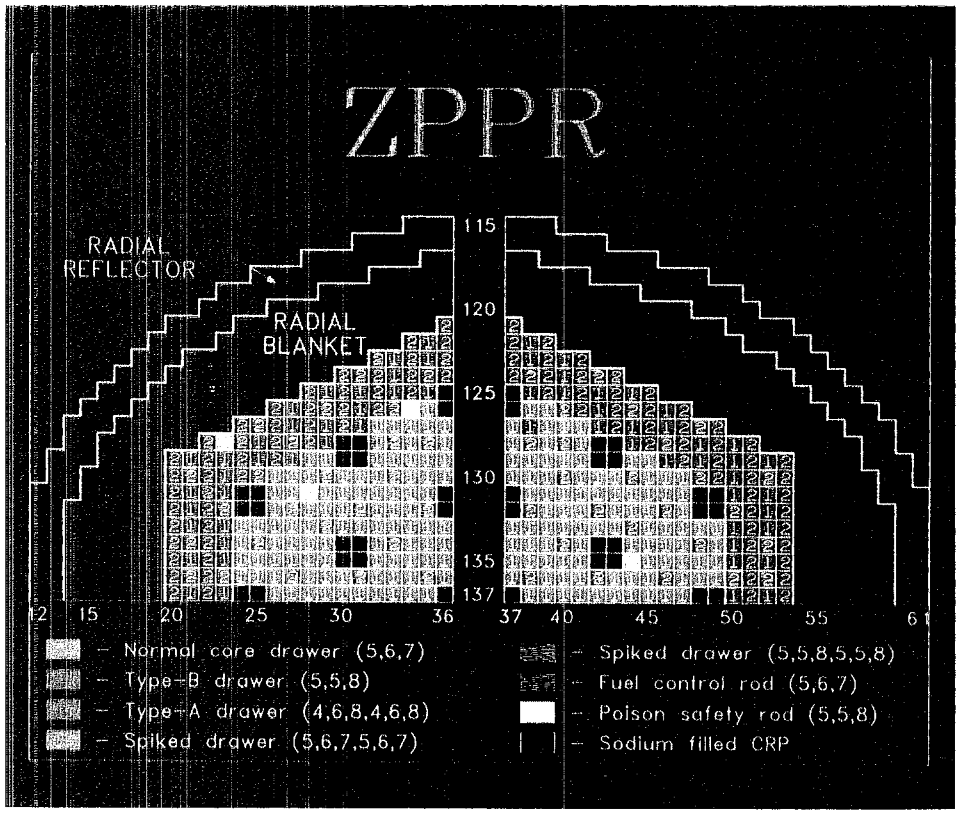
The people who use MAPPER think as much of it as Dahl does. "I love MAPPER; I'm hooked on it," said Kathi DeGasperi, an illustrator in H-1. A student of art with no computer background, DeGasperi was intrigued by MAPPER-produced slides. When she heard claims that anyone could learn how to produce computer graphics with MAPPER, she decided to test the claim herself.

"Dave spent the time and I learned how to use it. It took me about twice as long to learn as some of the other students with computer backgrounds, but I finally learned." Now DeGasperi says she can make color text slides or VuGraphs with MAPPER in about a third of the time it would take to do by hand.

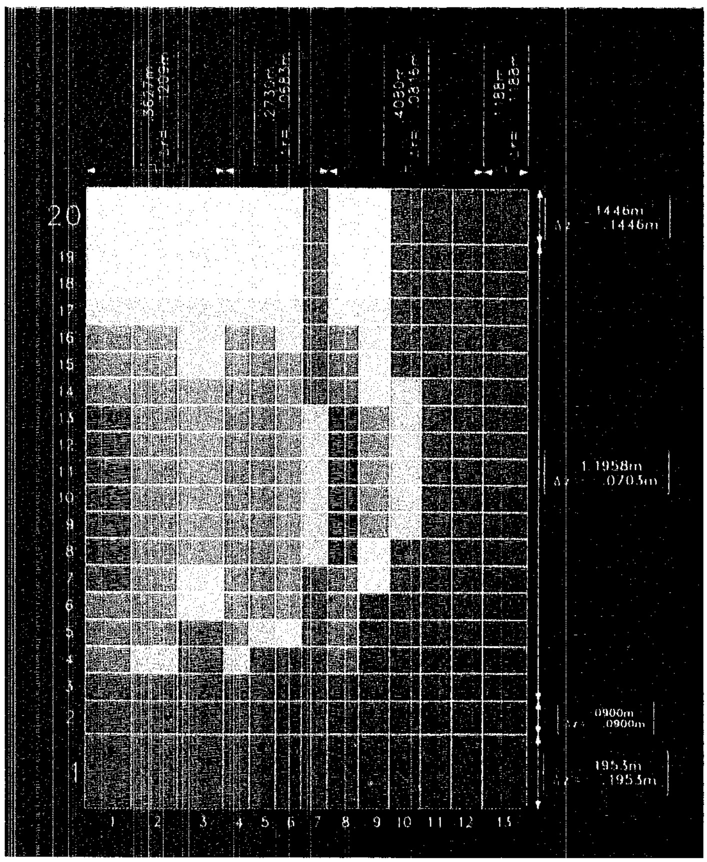
Other MAPPER users repeat the same accolades. "I was so impressed." "It's so easy to use." Judged by MAPPER's success, Dahl's philosophy has obviously paid off.

"Our basic philosophy," said Dahl, "was to try to produce a code that would serve the needs for general graphics — for presentations and reports — that was easy to use, but yet inspired the creativity of the user. The whole philosophy on MAPPER, and, I think, the reason for its popularity, is that the major focus of the code is to try to make all the neat stuff as easily available to the user as possible. On the one hand, you can make simple stuff without having to know very much. Or you can be as creative as you want."

— JJM



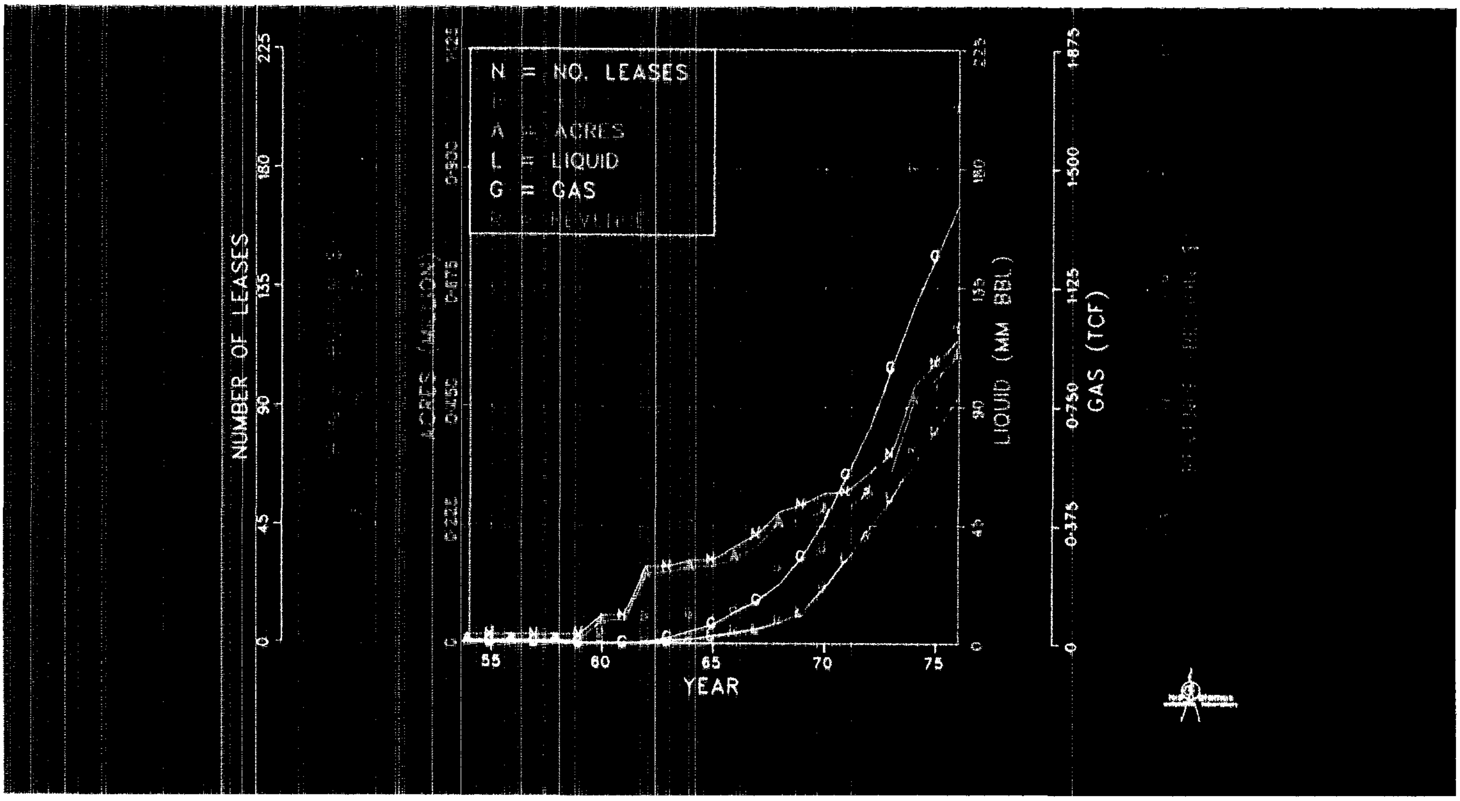
Ed Kern



Patrick Hodson

Top: This computer simulation shows the amount and type of fuel in the core of a research reactor.
Bottom: This mesh plot shows the location of core materials in a reactor.

offshore leases: computers help S-1 get the picture



Myrle Johnson

By Jeff Pederson

On Oct. 13, 1954, the federal government first offered tracts on the outer continental shelf to be leased for exploration and development of petroleum resources. Since then more than 3,500 tracts, mostly in the Gulf of Mexico, have been leased through competitive bidding in some 49 sales.

To give some idea of the magnitude of this activity, from 1954 to 1978 the government received $21.9 billion in bonuses through leasing offshore tracts. A total of $28.6 billion has been realized as revenue from production (These figures include neither the substantial development costs nor the one-sixth of all production revenue paid to the government as royalty).

In short, management and regulation of the leases are obviously major responsibilities. Our offshore hydrocarbons, gas and oil, play a major role in America's energy plan. An equitable price must be secured for the resources. Leased tracts should be explored in a timely and exhaustive way. Production of resources should be efficient and prompt. Policies and practices relating to offshore activities must be evaluated.

For the past 5 years what is now the Statistics Group (S-1) of the Systems, Analysis and Assessment Division has been developing methods to analyze and display data associated with offshore oil and gas leases. Funding is by the Conservation Division of the U.S. Geological Survey (USGS) and support comes from the C, Q and E Divisions at LASL.

Activities have included management and distribution of lease, production and revenue data; statistical analysis and graphic display of the same; developing automated cartography to display the offshore tracts; evaluating models for the maximum efficient rate of production; and developing computer models to study geophysical data used in exploration and production. Ray Waller, S-1 group leader and program manager for these projects is supported by the technical contributions of more than 20 people.

25 years of data

The backbone of the investigations is the lease, production and revenue data base, which includes 25 years of information as a resource to be used in answering questions about offshore activities. The data base includes which tracts received bids, what bids were received, which companies placed the

Above: This time graph shows cumulative lease statistics for one of the top 12 oil and gas companies. The magenta axis shows millions of acres purchased; the green represents billions of bonus dollars bid; the blue is millions of barrels of liquid produced; and the red is trillions of cubic feet of gas produced.

bids, which leases were issued, what prices were paid for them, production figures and geographic location of leases. After receiving information compiled by the General Services Administration's Systems and Programming Branch in Fort Worth, Group S-1 maintains it in a data base management system. With this system, the data can be efficiently retrieved, manipulated, revised, corrected and updated.

A computer system that combines graphic display with data management allows a researcher to query tne files for bidding data, production records or rental information, and then display the results on a screen. Myrle Johnson, S-1, said that computer graphics can provide a useful tool in analyzing the data for management reports: "Graphic methods are also used to check the quantity and quality of the data by exposing 'nonsense' data through visual display." Graphics capabilities also help condense large amounts of data into a more comprehensible form for easy communication.

Analysis: What do data say?

The data resource helps answer questions for policy makers. Areas previously or presently being investigated include:

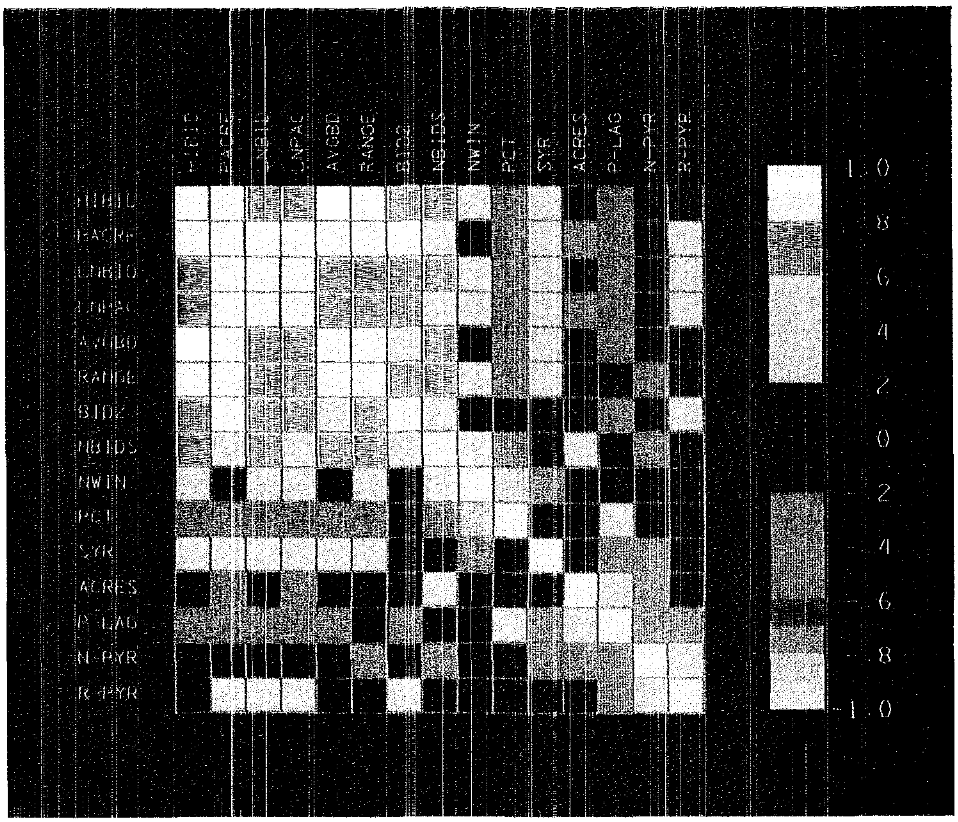
1) Is competition desirable? How is "competition" to be defined for sales of offshore tracts? Can competition be measured? If so, how?

2) Is it important that some firms win a significantly higher proportion of tracts on which they submit bids?

3) Is the government's pre-sale evaluation of a tract adequate? How does the pre-sale value relate to the bidding and production data?

4) How has the ban on joint bidding by major companies changed the number of bids received? The size of the bids submitted?

This table reveals statistical correlations of variables associated with offshore oil and gas leases.

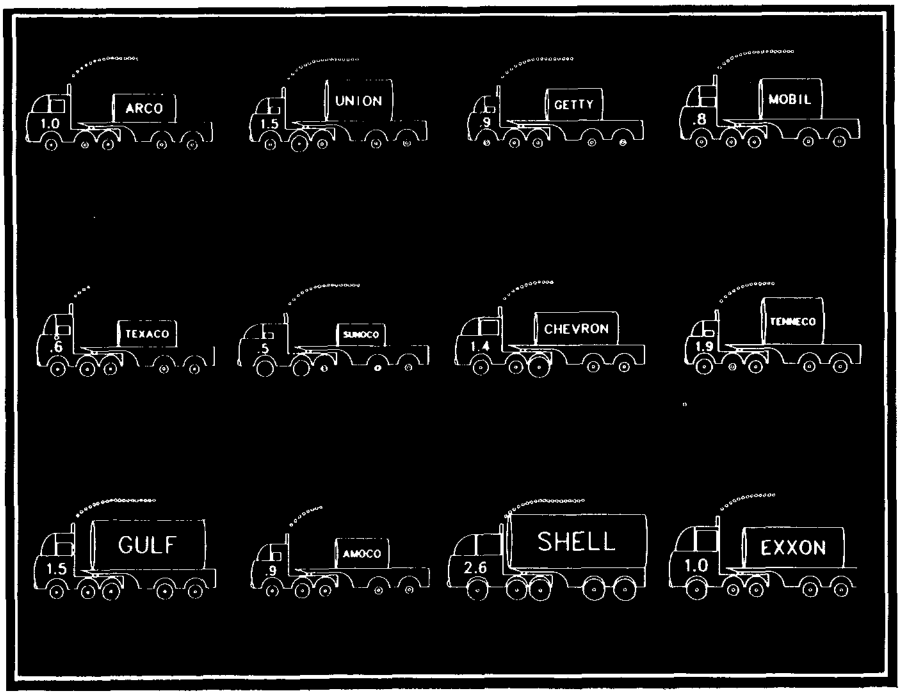


Myrle Johnson

Computer graphics can condense large amounts of data into a more comprehensible form for easy communication.

GULF	174.50	0.36	0.60	1583.88	0.83	50.70	3.70	2300.18	1.45	2.30	422.20	281.78	0.36
	8.49	13.00	4.31	28.43	22.93	5.49	3.85	5.03	1.45	32.39	72.41	4.44	4.29
AMOCO	140.90	0.26	0.53	690.33	0.69	26.10	6.30	591.64	0.86	0.80	55.60	106.66	0.39
	7.31	8.00	3.77	20.77	21.49	3.57	14.90	2.44	0.86	19.35	33.75	2.47	4.71
SHELL	359.30	0.38	0.91	1365.32	1.79	67.90	3.60	3539.47	2.59	2.60	566.30	507.79	0.51
	14.98	14.00	6.69	26.56	32.80	6.84	3.42	6.91	2.59	35.00	87.61	6.98	6.43
EXXON	284.60	0.37	0.88	1930.72	1.43	36.10	5.00	2017.68	1.05	1.60	339.30	259.74	0.31
	12.35	13.50	6.46	31.41	29.10	4.35	9.38	4.60	1.05	26.30	63.67	4.19	3.57

Communicating statistical information is a challenge.



Above: Larry Bruckner and Tony Montoya designed this computer-drawn oil truck, which displays various lease and production data for companies involved in offshore oil and gas leasing. Numerical data are represented graphically by various characteristics of the trucks, such as length of smoke plume and size of wheels.

Questions of this type may be raised by the USGS, the Bureau of Land Management, LASL staff and others. Recently, the Federal Trade Commission asked for assistance in obtaining data to study whether the number of bids submitted per tract had declined — after major oil companies were prohibited from bidding together as partners.

Pictorial representation

Communicating statistical information is a challenge. One avenue of study has been the use of figures to pictorially represent sets of data. For example, the data base contains information for each company that includes average years required to reach production on a lease, gas production per lease, oil production per lease and so forth. The question of how to best present multiple information concerning several companies has been addressed with two pictorial techniques.

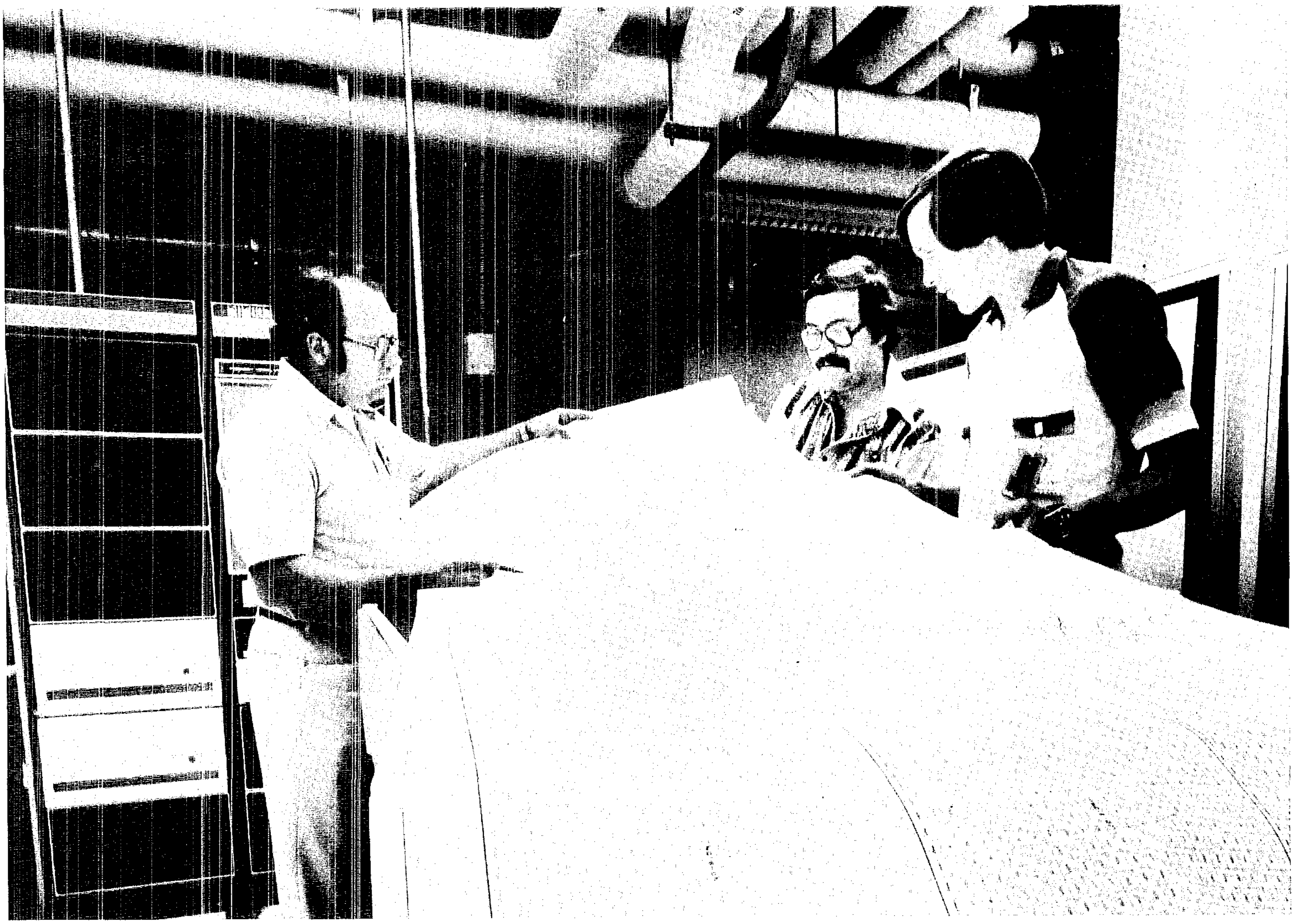
One tool is the Chernoff face, introduced by Herman Chernoff in 1971. He represented data with 18 dimensions by associating the variable values with facial features. Herbert T. Davis, Jr., added nose width and ears to the face to accommodate 20 values. Eyes on a Chernoff face, for example, can represent the number of leases won through bidding, while the curve of the mouth can represent the bonuses paid. The main problem with Chernoff faces is the subjectivity on the part of the viewer. It is also difficult to see the face as a union of 18 to 20 independent variables.

In a second technique, Larry Bruckner and Tony Montoya of S-1 exploited the Chernoff face idea to develop a truck figure displaying 13 different variables. The tractor portion of the truck represents investment (total bonus, number of leases and acreage). The trailer denotes production (revenue, gas production and liquid production). The exhaust plume is related to the speed with which companies bring leases to production status. If the Shell group has a long plume, for instance, it has brought offshore developments to fruition relatively quickly. If the plume is shorter for the Texaco group, it has been slower.

One might ask which group is more diligent in pursuing exploration and production. Such questions are complex and cannot be definitely answered by looking only at the time required to reach production. This situation is typical of data uses, in that policy and regulation questions are frequently raised but can be only partially answered with available data alone.

For example, how do the bidders compare? One study looked at the number of leases acquired, acreage involved, bonus paid, liquid production, gas production and bidder's share of gross production revenue on a yearly basis. Color-coded multiple axis plots were drawn for each of the major bidders. The results show wide variations in how successful bidders have been through 1976.

The figures may not always be what they seem, however. As Bruckner said,



LeRoy N. Sanchez

"Direct comparisons may be misleading. Where bidding activity started recently, higher bonuses will have been paid and leases will not have had a very long time to accumulate revenue. Also, our study found no discernible pattern between the amount of revenue obtained per dollar of bonus paid, on one hand, and dollars paid per acre, on the other."

Cartography: Automated mapping

A major USGS concern is that hand-drawn maps become outdated before they are completed, because they require substantial time to produce. Offshore activities are ongoing: New leases are being continually issued, old ones relinquished, new wells drilled and old ones plugged. The leases generally provide changing data. By storing both geographic data and leasing data on a computer, accurate and current information is available to draw maps more efficiently. Displays can be previewed and edited on a computer screen, then transferred to 35mm color slides from which enlarged prints can be made.

One might then ask whether the day of hand-drawn maps is giving way to automated cartography. Myrle Johnson and John Sibert, S-1, have modified computer software to combine data management and graphic techniques for the automated construction of maps. A variety of assorted information can be displayed on them.

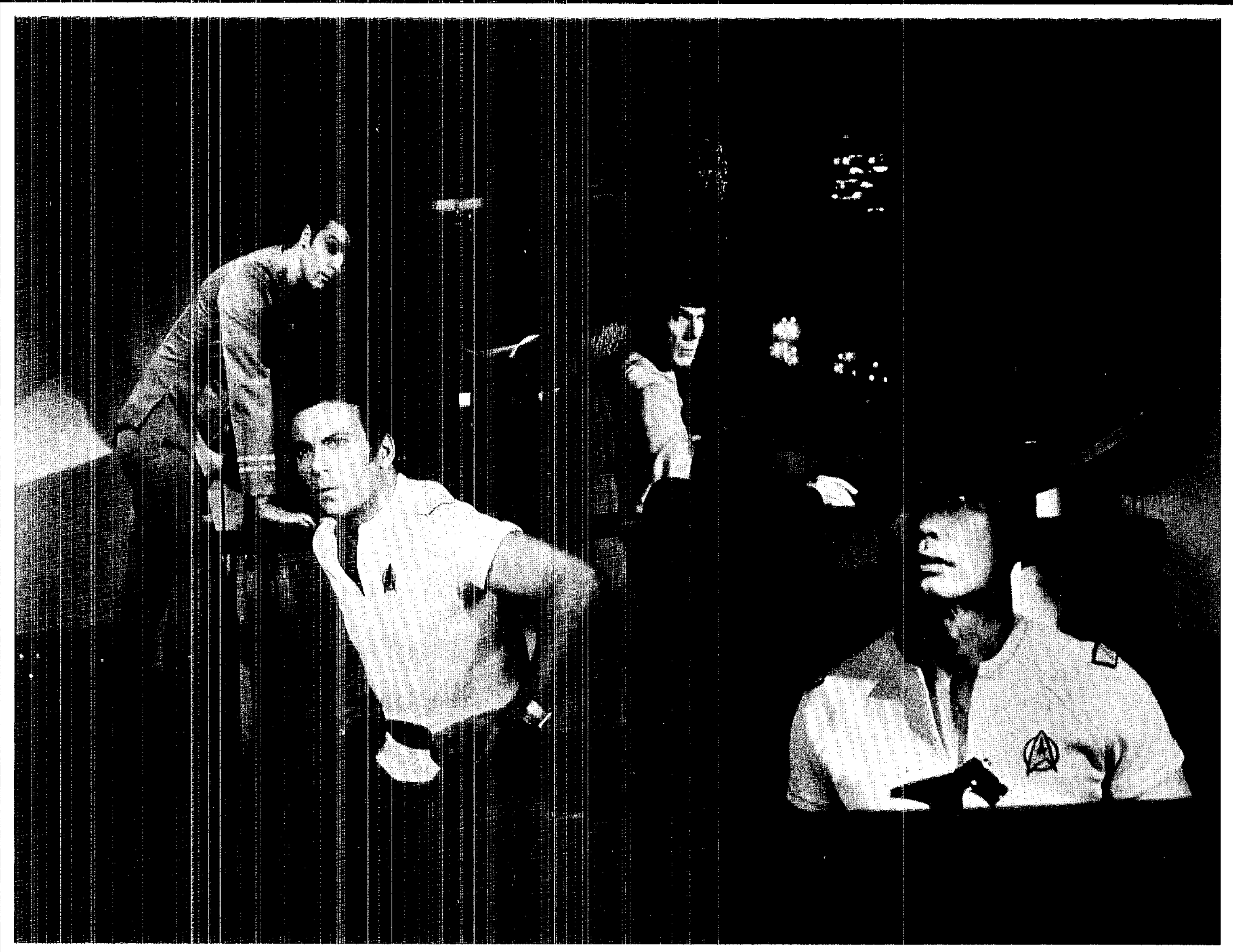
Related activities

Group S-1 has investigated various definitions of the maximum efficient rate (MER) of recovery of hydrocarbons from reservoirs, as well as the effects of reservoir and economic factors on the solutions. Staff members have computer MER solutions for particular gas-water and gas-oil-water reservoir models. They have varied such parameters as royalty rates, production rates, discount rates and initial reservoir conditions. They have established optimal controls for models of enhanced recovery in gas-water reservoirs by water flooding. Statistical methods have been developed to aid in choosing appropriate reservoir models. A computer-generated color movie was produced to illustrate how the ultimate production changes with different production scenarios.

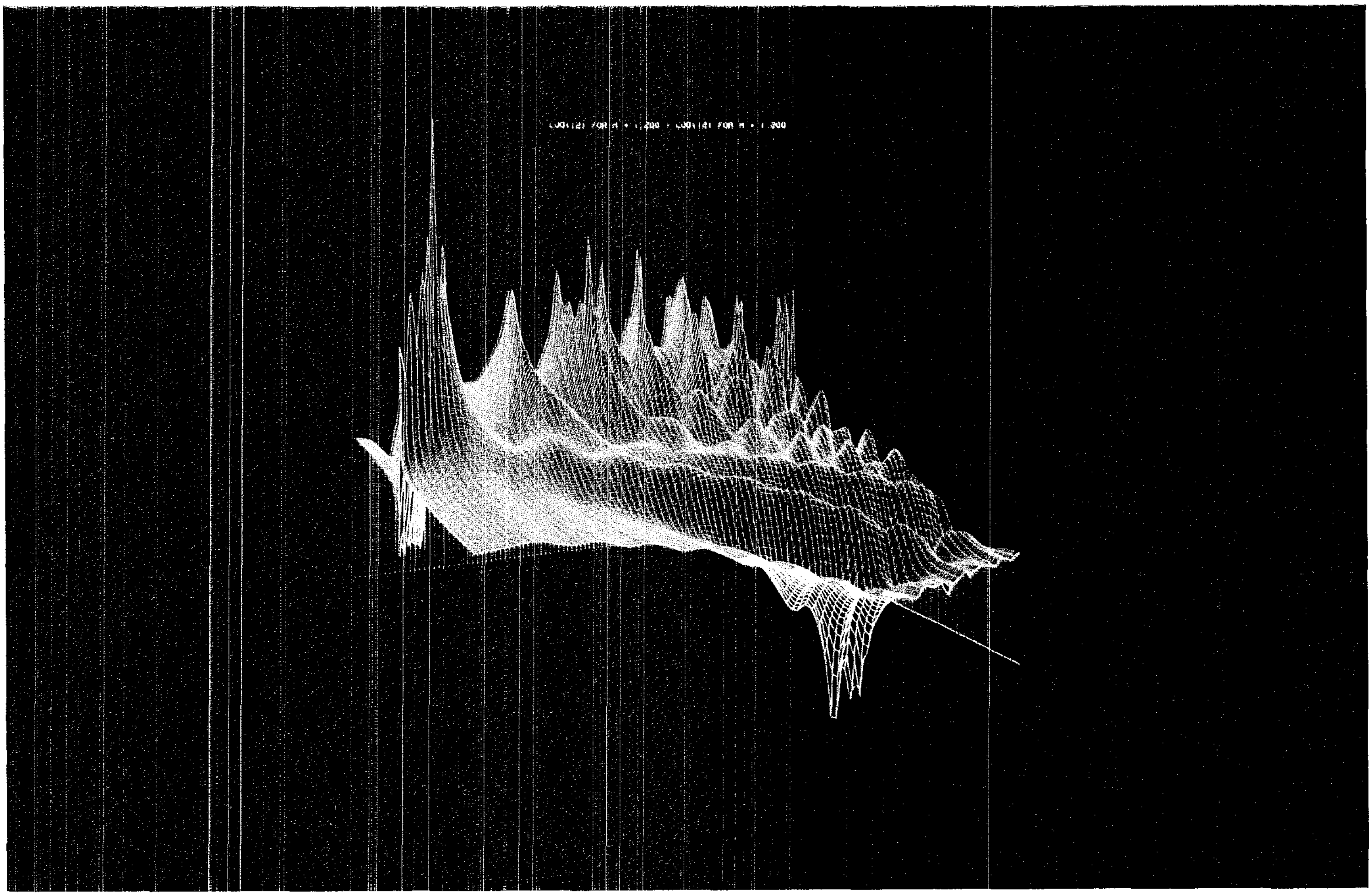
The geophysical interpretive aid system (GIAS) is an evolving set of computer program modules being developed by the Gulf of Mexico Offshore Continental Shelf Operations Office of the USGS in Metairie, La. The system of programs may be used throughout the USGS for data analysis pertaining to the assessment and evaluation of geological data that relate to the exploration, discovery and production of hydrocarbons. Group S-1's part in this program involves modifying existing modules and developing others. Activities have included developing modules for abnormal pressure calculations, seismic modeling to include synthetic seismogram and sand-shale ratio models. The planned system will be interactive and will provide graphic display capabilities.

Above: Jesse Cheatle (S-1), Kenny Brown and Jerry Dunlop (both C-1) check the quality as the PAGES Versatec plotter reels off a 10-foot-long map of the U.S. Gulf Coast, showing 40,000 blocks and data for more than 4,000 offshore oil and gas leases.

lasl's graphics trek to hollywood



"Computers can give the illusion of three dimensions by using perspective or by adding axes or a transparent box to aid the eye in judging sizes and distances."



Melvin Prueitt

By John Ahearne

At a speed somewhere between warp factor six and warp factor eight, some time around star date 5328.1, and somewhere on the bridge behind a Vulcan with pointed ears and a female navigator with no hair . . . There it was — Dan Koenig's and Mel Prueitt's color graphic representation of the Study Center slowly rotating on a terminal (or CRT, or television set, or whatever they're called in 5328.1).

Not only that, but there was Don Dickman's and John Goldstein's laser pulse; Mel Prueitt's rotating particles and undulating surfaces; Bob Orr's exploding beer can; Sue Bunker's galactic model; and the colliding nuclei created by Bob Hotchkiss, Frank Harlow, Tony Amsden and Ray Nix.

Now that all of you non-Trekkies are thoroughly confused, let us explain. The bridge is aboard the Starship Enterprise in the film "Star Trek, The Movie," warp factors are the fictional future equivalents of miles per hour, star dates are the outer space version of the Gregorian calendar, and the Vulcan and bald woman are the characters Spock and Ilia. The laser pulse, rotating particle, exploding beer can, galactic model and colliding nuclei are all LASL computer graphics that found their way to a movie set as part of Hollywood's idea of the technical backdrop in the far distant future.

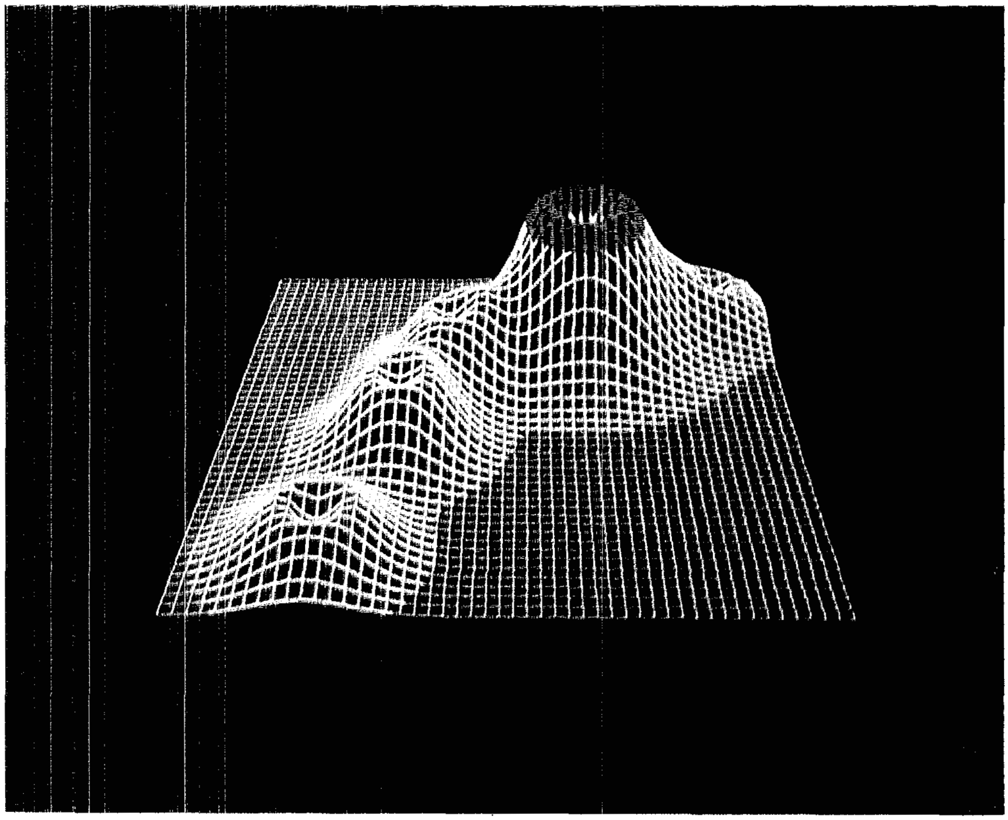
There have been other Hollywood

Facing page: Computer graphics by LASL staff members that appear on the screen of the Starship Enterprise add a flavor of the future to "Star Trek, The Movie." ©1979 Paramount Pictures Corporation. All rights reserved. Above: Colors help to distinguish surfaces on complex computer graphics.

movies, textbook covers, magazine covers, album covers, even an art show comprised of the aesthetically appealing products of LASL researchers, programmers and computers. Clearly, in addition to their technical usefulness to scientists here at LASL, the grace and beauty of computer graphics have appealed to designers and producers using advanced technology as an underlying theme.

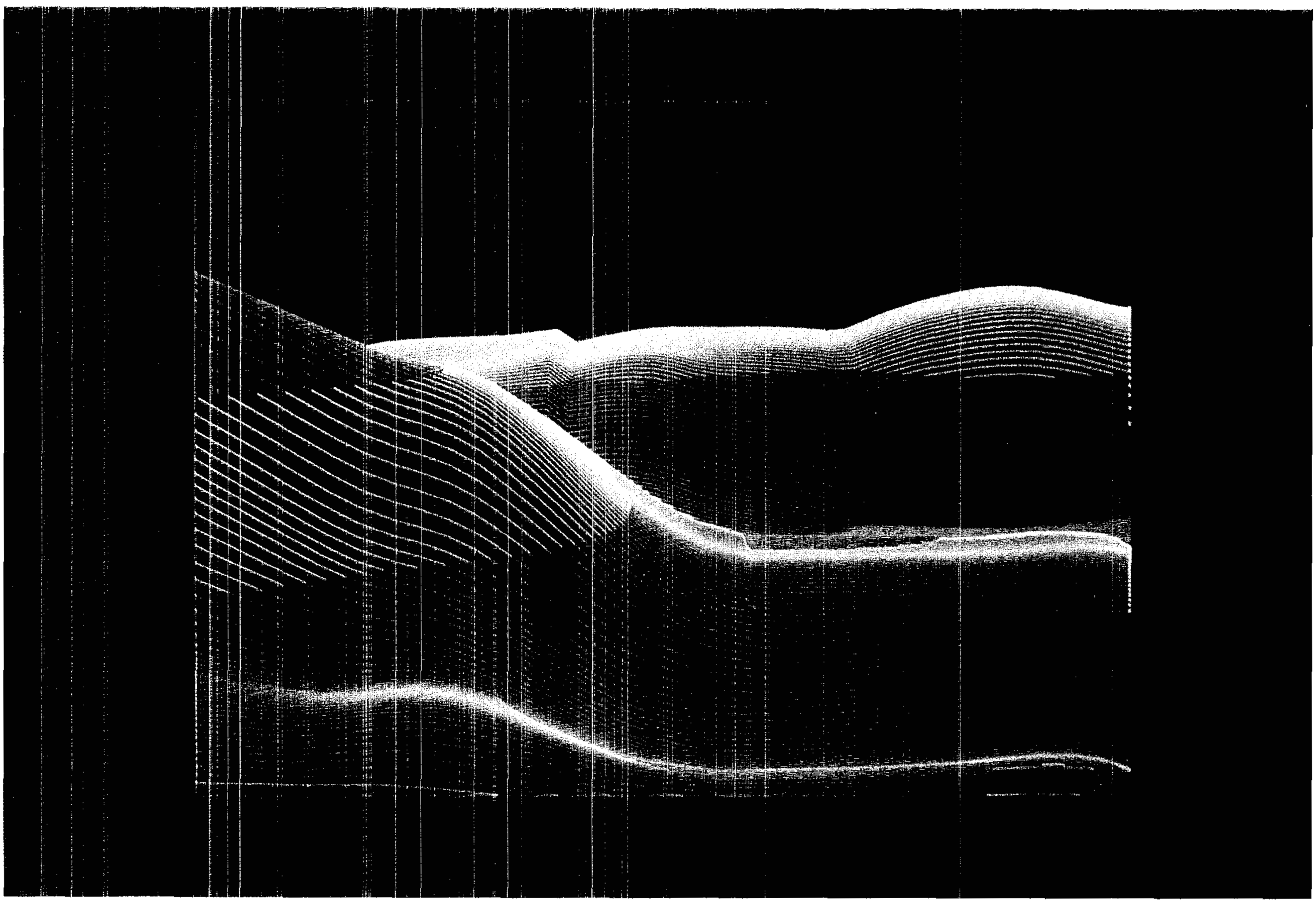
Computer graphics, quite simply, are pictures produced by a computer — converting numbers into a visual product. The graphics can represent physical data collected and fed into the computer or can be the result of data produced from calculations within the machine itself. Often in the type of research conducted at LASL, the graphics provide a vehicle for understanding complex problems by supplementing volumes of paper and millions of numbers with a medium more amenable to human sensory capabilities.

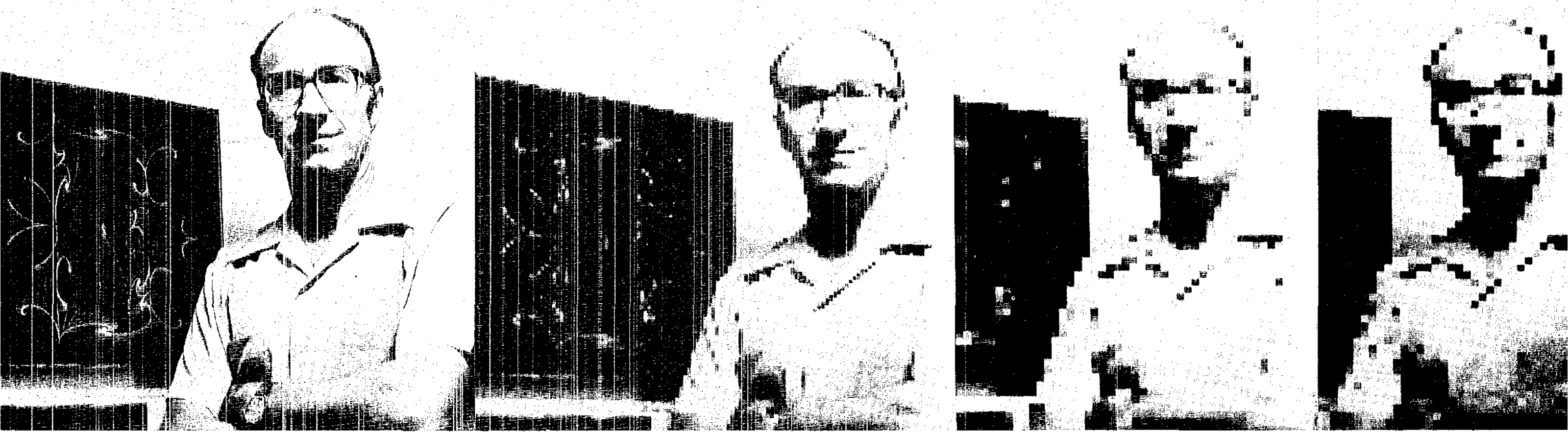
X-4's Mel Prueitt, one LASL scientist who has long been involved with computer graphics, likened the lack of computer graphics in research to a skilled surgeon performing delicate heart surgery blindfolded. "Some of us run problems on the computer which produce printouts full



Melvin Prueitt

Above: Computer graphics can be used to speed up geologic processes, for example, the evolution of a chain of volcanic islands.
Below: Prueitt's versatile graphics program, CONTUR, can produce realistic "calculus landscapes."





"The artist may conceive of eloquent designs, but he must face the difficult task of instructing the computer to duplicate his conceptions."

of numbers," Prueitt said. "But without graphics, we really can't see what we are doing."

Prueitt picked up a 3-inch-thick computer printout crammed with perhaps 300 multi-digit numbers on a page. "Anyone can read and understand one of these numbers," he said, pointing to eight digits in the midst of the stack. "But often it is extremely difficult to see a relationship between this number and one in another part of the printout," he added, referring to another large number several pages from the first.

"Without graphics, we try to mentally construct such relationships — in essence, to create a mental picture of the process being described by the mathematics and calculation results. This process is time consuming and often — given the complexity of some of the problems — impossible," he said. "Computer graphics allows us to immediately comprehend complex sets of data or equations and to see subtle anomalies and trends hidden deep in thousands of numbers."

Prueitt sees graphics as a tremendous tool for researchers because of the highly evolved, built-in system people have for understanding the visual. "That system has the capability for instant analysis even though a scene may contain billions of individual bits of information. Why not take advantage of that capability?"

Prueitt began his long fascination with computer graphics in 1971 while working on his doctoral dissertation at the University of New Mexico. His research, which dealt with molecular dynamics (how molecules bounce around and strike against one another), resulted in computer simulations that produced 43,000 numbers a cycle representing pressure, velocity, temperature and energy over hundreds of time cycles.

"Out of sheer desperation stemming from this overwhelming amount of data, I wrote a program called PICTURE that created a plot of the data in graphic form. From this I could easily see relationships — peaks and valleys, and subtle variations in the data," Prueitt said.

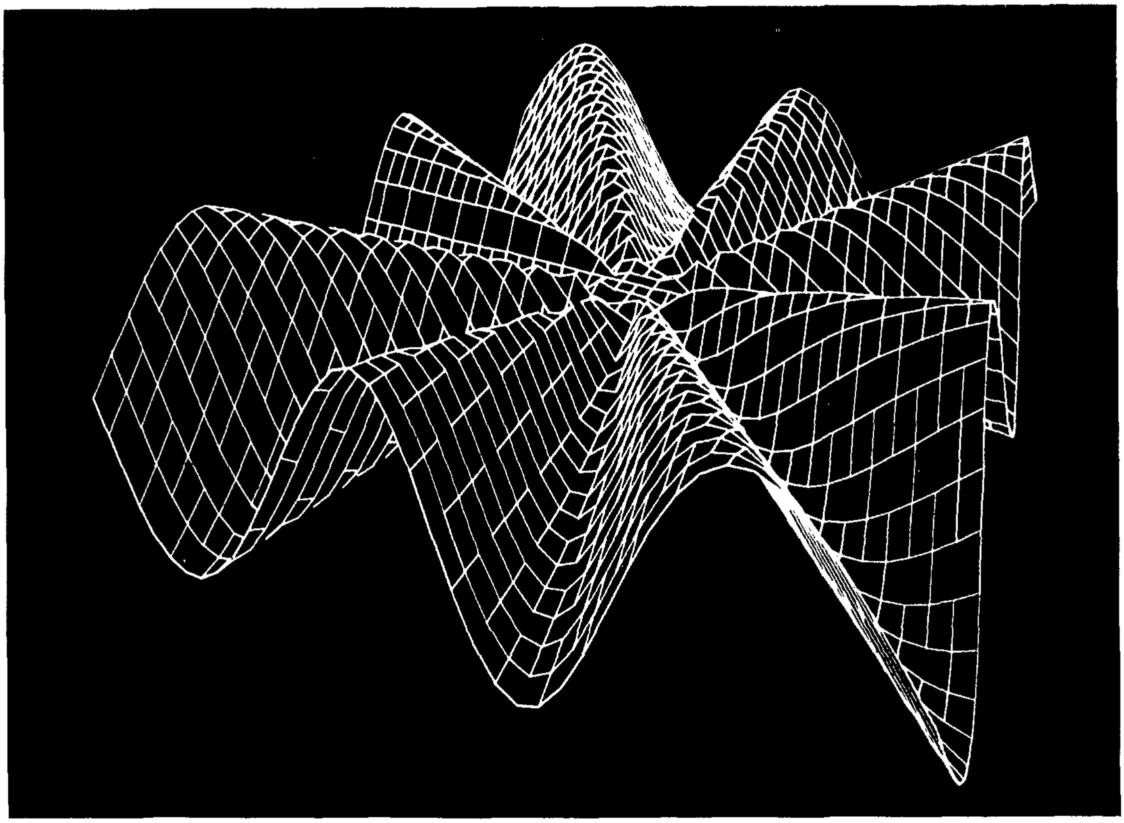
Since then, Prueitt has continued translating numbers into pictures — much of it on his own time. Others, like WX Division's Don Dickman, have had a long-standing interest in graphics and spent much of their time in developing programs and applying computer graphics to their work. From efforts like Prueitt's and Dickman's in the late sixties and early seventies, computer graphics began catching on rapidly. LASL established a computer graphics group, other programs were written, and other laboratories and government agencies began calling on LASL to provide the technical know-how — and sometimes even the programs themselves.

Prueitt's PICTURE program set the stage for sophisticated graphics packages by offering perspective plots that create the impression of three dimensionality.

"The principal value of computer-drawn

Above: Mel Prueitt (X-4) might be called Mr. Computer Graphics. He's shown here with some examples of his work that appear in LASL's "Designs by Computer" exhibit. Photo by LeRoy N. Sanchez. Computer digitization by Mike Cannon.

Melvin Prueitt



"This is all done with numbers. Nothing remotely resembling an image appears, until the numbers, in the form of electronic pulses, reach a plotting device."

Above: Graphic representations of mathematical functions allow researchers to visualize equations.

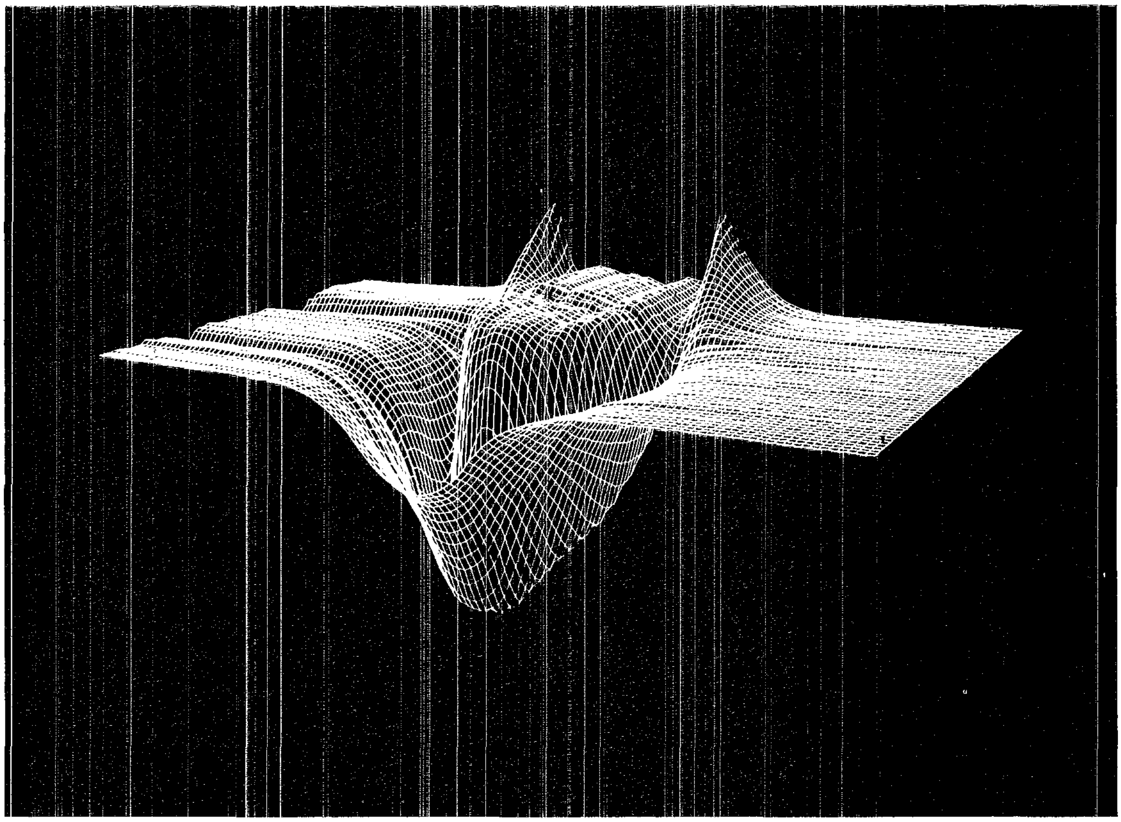
perspective plots lies in man's ability to comprehend a visual form akin to the three-dimensional world in which we live," Prueitt said. "Even though a computer has provided a drawing on a two-dimensional paper, for example, the brain can instantly transform the image into three dimensions."

Another feature of Prueitt's PICTURE program, and subsequent codes, resolves the problem of lines in the foreground of the graphic superimposed on lines in the background, resulting in visual confusion. The problem is solved by removing the "hidden lines" with special parts of the program designed to determine what lines should be visible from any given viewpoint.

Color is another feature that enhances the value of computer graphics. On a map, for example, Prueitt's use of varying colors to represent changes in elevations is a lot easier to comprehend than one with small numbers along the lines of elevation. Dickman used color in his laser pulse program to represent various media through which the beam passed, giving the viewer an easy means of following the beam path and an immediate sense of the time the pulse takes to pass through each medium.

In another example of the dramatic use of computer graphics, Prueitt was called upon to assist LAMPF researchers with the tuning and adjustment of a newly installed bending magnet designed to direct portions of the beam to experimental areas.

"Of course, you cannot see a magnetic field, and the researchers wanted to know



Melvin Prueitt

"These images are the progeny of what is perhaps a far more magnificent beauty — the beauty of a logic system . . . seldom observed by anyone but the programmer."

if there were any irregularities in the field that might cause particle loss from the beam," Prueitt said. "Without the use of computer graphics, the fine adjustments necessary to perfect the magnetic field would have been hit and miss."

Instead, the researchers took measurements of the strength of the field at 25,000 points and created a computer graphic from the data. The illustration clearly showed faint striations in various places across the field and allowed the LAMPF scientists to correct problems affecting the field.

Prueitt says much of the research conducted at LASL involves numerical output that translated into computer graphics could be highly beneficial to the scientist.

"Anyone in the Laboratory interested in perspective plots can call me or can learn about the variety of codes available by talking to C-6, the Computer Graphics group," Prueitt announced.

Prueitt also sees an extra plus in the spread of computer graphics because it allows the public a more easily understood means of learning about work done at LASL.

"Many of the graphics we produce can be used as visuals to clearly describe our mission to the layman," he said. "We have had tremendous response from the public already with some of the computer graphics we've published or shown. Not only does this enhance LASL's image, but helps create and maintain interest in science and technology."

Above: This illustration, created by 25,000 magnetic field measurements at LAMPF, showed faint striations in the field.

Quotations from ***Computer Graphics: 118 Computer-Generated Designs,*** by Melvin L. Prueitt, Dover Publications, Inc. 1975.

among our visitors

PVB 8028F-82

Bill Jack Rodgers

PVB 8028 F-94

Bill Jack Rodgers

PVB 80295-S

LeRoy N. Sanchez

Above: The Wilson family, shown here in the Central Computing Facility (CCF), was one of hundreds that toured the Laboratory during Family Days. From top to bottom they are Doug Wilson (X-1), wife Christie, Brant, Susanna and Richard.

Above right: The Oldtimers' Reunion, held in conjunction with Family Days, brought thousands of visitors to the Laboratory. Among our guests were former Directors Harold Agnew and Norris Bradbury, who with present Director, Don Kerr, were interviewed by Tom Brokaw for the Today Show.

Right: When asked what they did last summer, these 6 students, and 24 others in LASL's Summer Science Student Program, will have a lot to tell. Shown here, from left to right, are Carla Valdez; Tommy Romero; Anthony Atencio; Eloy Gonzales, Industrial Relations Officer, DOE Albuquerque Operations Office; Ted Roybal; Beverly Martinez and Leonard Abeyta.

years ago

10

New division and department

A new Information Services Department was formed with D. F. Sundberg as department head. The reorganization involved D Division, the Public Relations Department and Mail and Records.

Birdseed series

The launch of the Nike Tomahawk rocket, "Roadrunner," marked the beginning of the Birdseed series of barium injections over Kauai. Don Kerr of J-10 was scientific aircraft commander in one of the AEC's NC-135 flying laboratories for the experiment.

Graduates

Degrees granted by the Los Alamos Graduate Center last summer numbered 15, bringing the total number of degrees granted to 172.

Deflated prices

The Bulletin advertised LASL cafeteria prices of

soup	30¢
main dishes	70¢
vegetables	20¢
desserts	25¢

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Slide rule course

A non-credit course on the use of the slide rule was offered through the Graduate Center. The registration fee for the course was $20.

Pretty pics

Prints of a panoramic view of Los Alamos (8¾ by 50½ in.) were distributed to payroll. The Bulletin notice added: "If you want another one to send to Aunt Hepsibah, you'll have to get one from somebody who doesn't like art." Two weeks later the Bulletin announced that a new shipment had arrived but cautioned "no hoarding, please — there should be enough to go around if people don't start collecting them like stamps or cigar wrappers."

Med meeting

LASL hosted a meeting of 41 medical and laboratory directors from AEC installations and contractors. This was the first time the annual conference was held in Los Alamos. Dr. Shields Warren, Director of the AEC's Division of Biology and Medicine, termed the meeting a success and spoke of increased understanding of radiation.

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License for the Lodge

The New Mexico Director of Liquor Control knocked down the last barrier to the establishment of a public cocktail lounge in Los Alamos by approving a dispenser's license for Fuller Lodge. Previously all drinking in Los Alamos had been confined to private clubs. Non-club members on the Hill have been advocating for some time the establishment of such a facility.

etc.

Functions and services offered by the Public Affairs Department have been transferred to the Information Services Department, the Assistant Director for Institutional Relations and a new Facilities Management Department, which will also include the Food Services group, ISD-10. Mail and Records (ISD-5) will be transferred to the office of Associate Director for Administration.

Three associate division leaders have been named for the Theoretical Applications Division: Dale Henderson for weapons physics, Delmar Bergen for weapons programs and Milton Gillespie for fusion and plasma applications. A new group, Code Development (X-7), was created, while Physics and Computation (X-9) was dissolved in the reorganization.

William Maraman has been appointed head of the Chemistry-Materials Science Division (CMB). He previously was head of the Plutonium Chemistry and Metallurgy group (CMB-11). John Birely, formerly assistant director in the office of the Associate Director for Chemistry, Earth, and Life Sciences, will serve as the alternate division leader.

More than 40 employees who filed patent applications between Oct. 1, 1979, and Feb. 29, 1980, received cash awards as part of a new program to recognize LASL inventors for their work.

patents

Patent 4,193,043, "Microwave Accelerator E-Beam Pumped Laser," was granted to Charles A. Brau (AP-2), William E. Stein (AT-1) and Stephen D. Rockwood (AP-2). The abstract states that the device uses a thyratron to modulate the microwave accelerator to produce electron beam pulses that excite the laser medium to produce laser-pulse repetition frequencies not previously obtainable.

Patent 4,194,170, "Shifting of Infrared Radiation Using Rotational Raman Resonances in Diatomic Molecular Gases," was granted to Norman A. Kurnit of AP-2. The device shifts the frequency of infrared radiation from a CO_2 laser by stimulated Raman scattering in H_2 or D_2.

Patent 4,194,813, "Vacuum Aperture Isolator for Retroreflection from Laser-Irradiated Target," was awarded to Robert F. Benjamin and Kenneth B. Mitchell, both of L-4. The abstract states that the edge of the focused beam impinges on the edge of the aperture to produce a plasma that refracts any retroreflected light from the laser's target.

Patent 4,197,461, "Miniaturized Radiation Chirper," was awarded to C. John Umbarger and Michael A. Wolf, both of H-1. The chirper, intended to serve as a personnel radiation warning device, is smaller and has a longer battery life than existing chirpers.

Patent 4,200,802, "Parabolic Cell Analyzer," was awarded to Gary C. Salzman (LS-2) and Mary J. Skogen Hagenson (Iowa State University). The device is a sensitive fluorescence collector that can efficiently analyze biological cells.

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